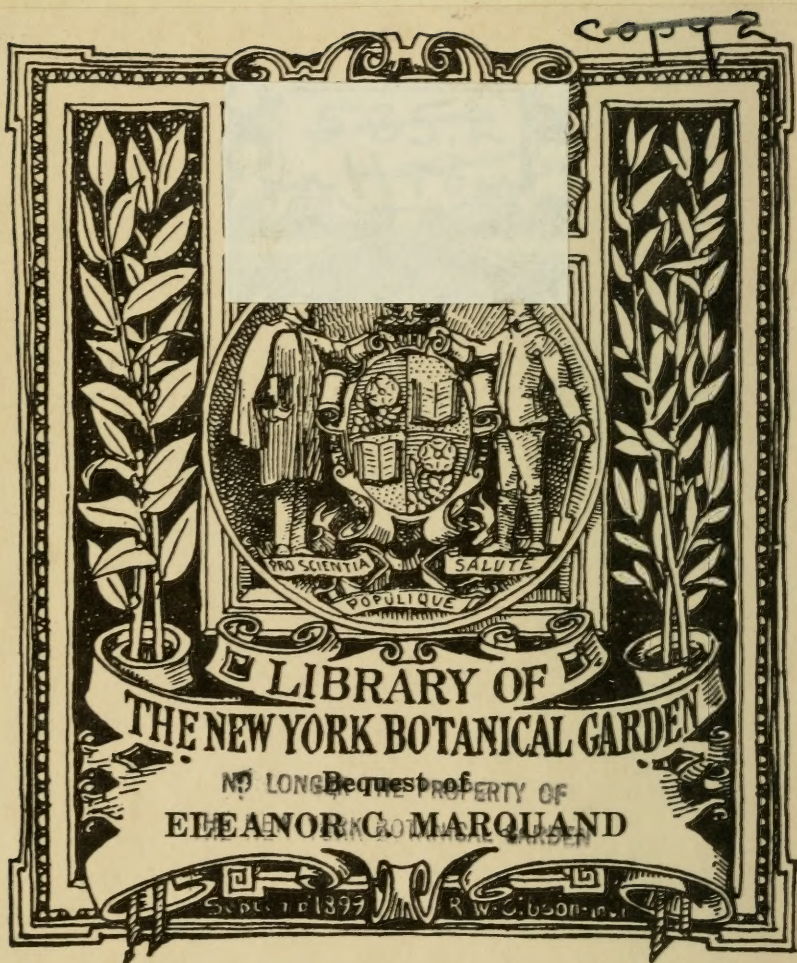
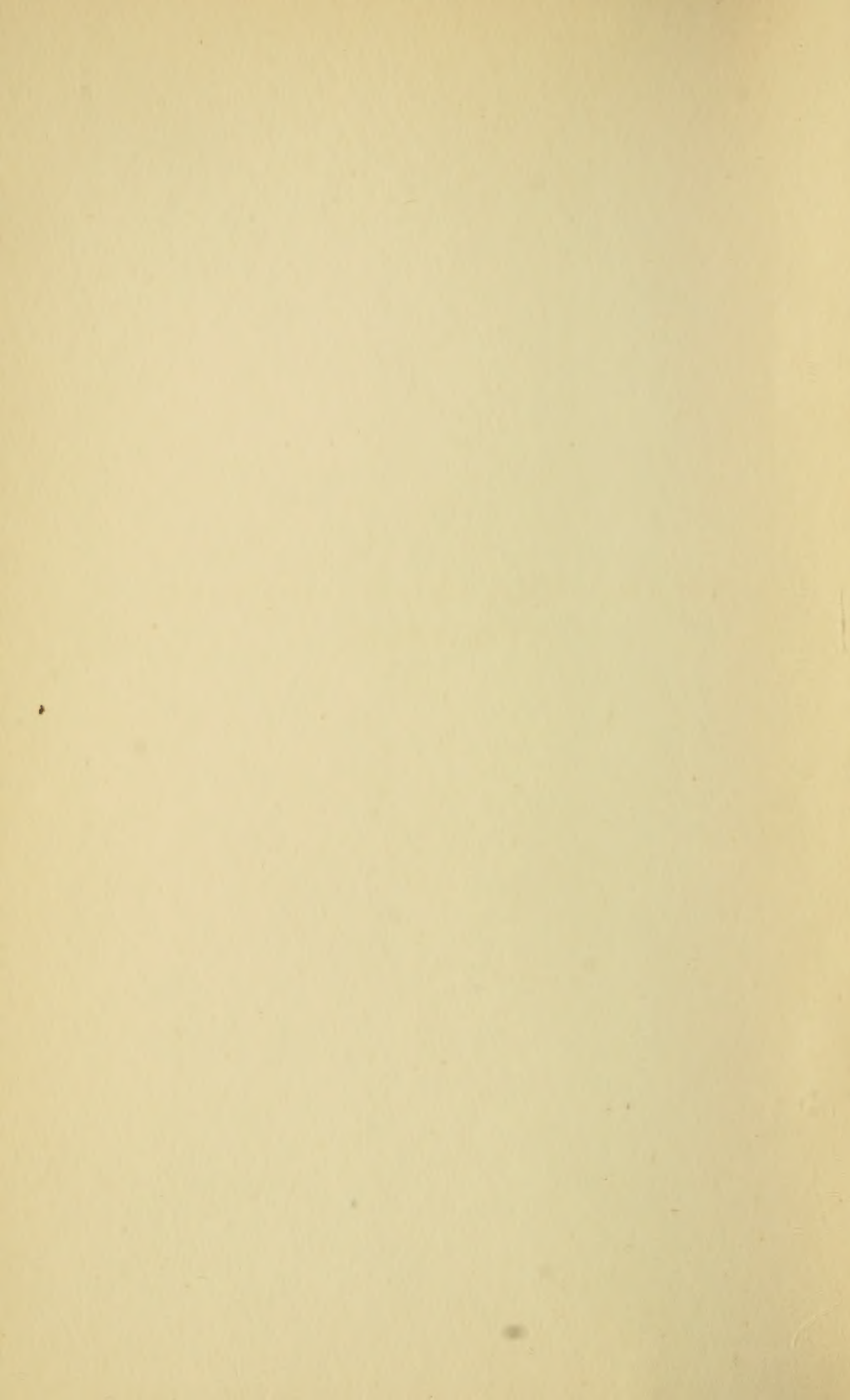


DWARF
AND
SLOW
GROWING
CONIFERS
—
HORNIBROOK



E. C. Magnaud.

Christmas, 1926.



**DWARF AND SLOW-GROWING
CONIFERS**



DWARF CONIFERS IN THE ROCK GARDEN AT LEONARDSLEE, HORSHAM, SUSSEX.

DWARF AND SLOW- GROWING CONIFERS

BY

MURRAY HORNIBROOK

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PREFACE

ALTHOUGH, since Loudon wrote his "Arboretum Britannicum" in 1838, most writers upon Conifers, following his example, have included occasional references to dwarf and other abnormal forms which came under their notice, hitherto no attempt has been made to collect together in one book the many forms recorded both in works upon Conifers and in the Gardening Press, and to disentangle them from one another.

In the present work I have attempted to deal with, as exhaustively as possible, all the dwarf and slow-growing forms of which records can be found, or which are in cultivation, and, in the case of forms already recorded, supplementing such descriptions as exist by a fuller description, based upon a personal examination of the living plant, or of a portion of it. I trust that, as a result, the identification of a good many interesting forms will, in future, be assured. At present, on account of their inadequate descriptions, many of them are in danger of losing their identity.

For reasons which are fully dealt with in the General Introduction, the work of disentanglement has been particularly arduous; but if, as I hope, the results of my labours prove of assistance to the many nurserymen and owners of private collections who have supplied me with materials for examination, they will not have been in vain.

In nomenclature, I have generally followed Elwes and Henry, and Beissner, and I have avoided technical terms as far as possible.

M. H.

KNAPTON,
ABBEYLEIX,
QUEEN'S Co.

POSTSCRIPT

WHILE this book was in the press the recent Constitutional changes in Ireland incidentally deprived me of my garden. The collection at Knapton has therefore been dispersed; a certain number of specimens remain in my hands, but most of the larger I have presented to the Royal Botanic Gardens, Glasnevin, Dublin, where they will be found planted out on a grassy slope beside the Rock Garden.

M. H.

January, 1923.

CONTENTS

	PAGE
INTRODUCTION	1
SOIL AND SITUATION	8
SELECTION OF VARIETIES	11
METHODS OF PROPAGATION	12
JUVENILE FORMS	13
ABIES	17
CEDRUS	25
CEPHALOTAXUS	27
CHAMÆCYPARIS	28
CRYPTOMERIA	55
CUPRESSUS	59
JUNIPERUS	60
LARIX	79
PICEA	80
PINUS	131
PODOCARPUS	148
PRUMNOPITYS	149
PSEUDOLARIX	150
PSEUDOTSUGA	151
RETINISPORA	155
SCIADOPITYS	156
SEQUOIA	156
TAXODIUM	157
TAXUS	157
THUYA	165
THUYOPSIS	183
TORREYA	183
TSUGA	184
INDEX	188

LIST OF ILLUSTRATIONS

DWARF CONIFERS IN THE ROCK GARDEN AT LEONARDSLEE, HORSHAM, SUSSEX	<i>Frontispiece</i>
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	FACING PAGE
A "WITCHES'-BROOM" ON NORMAL PICEA EXCELSA, AT OLD MAXWELL NURSERY, GENEVA, N.Y.	6
CHAMÆCYPARIS LAWSONIANA, <i>var.</i> FLETCHERI	32
CHAMÆCYPARIS OBTUSA, <i>var.</i> SANDERI, AT WELLESLEY PINETUM, MASS.	42
CHAMÆCYPARIS OBTUSA, <i>var.</i> TETRAGONA AUREA, AT CASTLE- WELLAN, CO. DOWN	43
PYGMY JUNIPERS (J. COMMUNIS, <i>var.</i> COMPRESSA), AT KNAPTON, QUEEN'S CO.	70
PICEA ALBERTIANA, FORMA CONICA, AT THE BAYARD PINETUM, SOUTH LANCASTER, MASS.	82
PICEA EXCELSA, <i>var.</i> CLANBRASILIANA, AT ABBEYLEIX HOUSE, QUEEN'S CO.	90
PICEA EXCELSA, <i>var.</i> GREGORIANA (VEITCH'S FORM), AT HIGHLANDS PARK, ROCHESTER, N.Y.	98
PICEA EXCELSA, <i>var.</i> GREGORIANA (PARSONS' FORM), AT HIGHLANDS PARK, ROCHESTER, N.Y.	99
PICEA EXCELSA, <i>var.</i> PYGMÆA, OVER 100 YEARS OLD, ON ROCK-CLIFF, LEONARDSLEE, SUSSEX	102
PICEA EXCELSA, <i>var.</i> MAXWELLI, AT THE OLD MAXWELL NURSERIES, GENEVA, N.Y.	103
PICEA EXCELSA, <i>var.</i> MICROSPERMA, AT THE ARNOLD ARBORETUM	116
PICEA EXCELSA, <i>var.</i> NANA, AT KNAPTON	117

PICEA PUNGENS, <i>var.</i> COMPACTA, AT THE ARNOLD ARBORETUM	128
PINUS DENSIFLORA, <i>var.</i> UMBRACULIFERA, AT THE ARNOLD ARBORETUM	134
PINUS RESINOSA, <i>var.</i> GLOBOSA, ON MRS. GEORGE CARPENTER'S ESTATE, WOLFEBORO', N.H.	138
PINUS STROBUS, <i>var.</i> NANA, AT THE ARNOLD ARBORETUM	142
PINUS STROBUS, <i>var.</i> UMBRACULIFERA, AT KNAPTON	143
PINUS SYLVESTRIS, <i>var.</i> PYGMÆA, AT KNAPTON	144
PSEUDOLARIX KAEMPFERI, <i>var.</i> ANNESLEYANA, AT CASTLEWELLAN, CO. DOWN	150
PSEUDOTSUGA DOUGLASI, <i>var.</i> FLETCHERIANA	151
TAXUS CUSPIDATA, <i>var.</i> NANA, AT ARNOLD ARBORETUM	164
TAXUS CUSPIDATA, <i>var.</i> DENSE, AT ARNOLD ARBORETUM	165
TSUGA CAROLINIANA, <i>var.</i> COMPACTA, AT ARNOLD ARBORETUM	186

DWARF AND SLOW-GROWING CONIFERS

“As one star,” says Dr. M’Cosh, “differeth from another in glory, so one tree differeth from another in glory.” Let it not be supposed, therefore, that anything said in praise of the dwarf conifer is in dispraise of his arborescent brother. Japanese gardeners have proved to us, not only that both types of trees may be equally admired, but also that both are necessary to the gardener, and have their own particular uses, and on behalf of the dwarf conifer I urge nothing more than the recognition of its claim to a suitable niche in the scheme of the garden.

Until quite recently, the dwarf conifer has rarely been used, outside Japan, in its proper place. The Japanese realised long ago that a pine of 100 feet in height was as out of place in a small garden as a pygmy juniper would be in the middle of the Black Forest, and they planted their trees with a due sense of proportion, using dwarf conifers for the adornment of temple courtyards and small gardens, sometimes planted out, and at other times as pot plants. But in European small gardens the inclination has been to plant arborescent trees; the names of the houses which contain them are usually a sufficient indication—The Firs, The Lindens, The Acacias. No doubt such a name has an imposing sound, but too frequently the justification for it is some over-large tree, whose roots rob the soil of the small garden of its richness, and whose boughs rob the house of light; or else one sees a row of melancholy pollarded trees upraising their

mutilated branch stumps in silent protest. The dwarf conifer was practically never found in such gardens; it was too rarely found in large pleasure-grounds, and even there was frequently ill-placed.

The few old specimens that still exist are nearly all planted on lawns. There seems to have been a period in British gardening—somewhere about 1850—when there was a growing demand for dwarf conifers for lawn planting. On the Continent there has always been a small but steady demand for pygmy trees, but in Great Britain it was a passing phase.

Loudon, in 1838, describes but ten dwarf conifers in cultivation; Carrière (1855-67) described about forty. They must have reached the high-water mark of their popularity early in the seventies, for in contemporary catalogues of the Lawson Nursery of Edinburgh and of Smith of Worcester one finds as many as forty-one dwarf forms of such for sale. In those days, when the dwarf forms were few in number, the nurserymen who owned them raised their own stock and one could get them true to name. Then followed a period of depression. The number of new arborescent species increased and, possibly for this reason, less attention was paid to garden forms. At any rate, the dwarf forms began to disappear from nurserymen's catalogues; year by year their numbers decreased. Nurseries changed hands, and the old specimen "mother plants" were lost sight of, or thrown out, until at last, in Great Britain, only in one or two old established nurseries, such as those of Veitch and Antony Waterer, could one still find original specimens. On the Continent most of the forms described by Carrière remained in cultivation, and were found in nurseries, such as those of Simon-Louis in Metz and Transon Frères in Orleans; but, generally, the cultivation of dwarf conifers had reached its lowest ebb, when the growing popularity of Rock Gardens revived it.

These pygmy conifers were just what was required to

add a touch of distinction to the Rock Garden, and seeing them there, the owner of a lawn or of a small garden began to realise what he had missed in overlooking them, and in how many ways they might be utilised. The demand for dwarf conifers recommenced, and became daily more insistent—but, alas! there was no longer a supply to meet it. Most of the old specimen plants had gone, and in many cases nothing remained but a name or an inadequate description. In the meantime, a considerable number of new dwarf forms had appeared on the Continent. In the nurseries of Späth of Berlin, Hesse of Weener, and in many smaller nurseries, unusual forms had been found, and, to a certain extent, propagated. The demand in America and Great Britain for dwarf trees had to be met, and consequently Continental sources of supply had to be tapped, and were tapped with disastrous results. It is not quite clear whether all these Continental forms had been previously named, but it is quite clear that when the demand arose for forms well known by name, such as *Picea excelsa* *Clanbrasiliana*, this demand was met largely by the supply of some strong growing, easily propagated, new Continental forms, that bore no resemblance to the originals. These false forms came almost entirely from the smaller Dutch and French nurseries, and Great Britain and America are now flooded with them, and the result is grotesque. I have seen and received one strong growing *Picea excelsa* form under no less than five different names, to none of which it can lay any claim.

The importing nurseryman is not entirely to blame; it is not to be expected that the average nurseryman could either spare the time or find the opportunity for tracing these forms and verifying them, and the few old Continental nurseries which might still be trusted to have the genuine article would be unable to supply anything like the quantities required; consequently, there was no check on the importation of impostors, and it was only when unsuspecting purchasers began to compare their specimens

that they began to realise that in many cases these differed in name, but not in appearance.

This was my own experience; I had started by growing a few of these little conifers in my rock garden, and found them so fascinating that I was encouraged to get more, and searched home and foreign catalogues for them; but after a few consignments had arrived, I realised that but few of the older forms were true to name, and I endeavoured to verify them.

It was not my first intention to go very deeply into the matter, but I found so many inaccuracies, due to the inadequate descriptions of the raisers of particular forms, and so many due to the careless naming of imported forms, that I came to the conclusion that the confusion would soon be hopeless unless the various forms were sorted out, verified, and described. It was imperative that this should be done while there was still a possibility of finding original specimens with which the forms in commerce and cultivation might be compared, and I decided to go into the matter as thoroughly as the material at my disposal and circumstances would allow. The results of my labours are given in the following pages.

For several reasons the task has proved to be one of great difficulty, and I hardly think that I should have persevered to the end had I not received such persistent encouragement and help from those to whom I applied for information and assistance. I am especially grateful to Professor C. S. Sargent of the Arnold Arboretum; from the first he has thrown open to me his splendid collection of dwarf conifers, sending me specimen branches and photographs. I also owe much to Mr. W. J. Bean, of Kew; Mr. John Dunbar, of the Department of Parks, Rochester, New York; to many nurserymen at home and abroad; and also to many owners of private gardens for information concerning specimens in their possession.

There are two kinds of dwarf conifers in cultivation:

(a) Trees artificially dwarfed.

(b) Natural dwarf-sports or seedlings of arborescent trees.

The artificial dwarfs may be dismissed in a few words. It is useless either to describe or enumerate them, as their number and variety depend almost solely upon the whim of the gardener who takes them in hand. Practically any tree can be "dwarfed" by adequate treatment. The subject is selected young, potted up, and then annually pruned, pinched, and disbudded at the inclination of the operator. The Japanese gardeners are the experts at this branch of arboriculture, and in some cases generations of gardeners have reverently tended some ancient specimen. There is one in the Yokohama Nursery—a dwarfed *Cupressus obtusa*—said to be over 400 years old, which is practically priceless; but even the smallest artificial specimen is expensive to buy, although, judging from the amount of care and attention even such must have received, the price seems hardly commensurate with the labour expended upon it.

But these artificial dwarfs are garden plants only so long as they remain in their pots, their pot-bound condition helping them to maintain their dwarf habit. Turned out of pots and left to their own devices, they soon attempt to regain their natural arborescent habit.

No further reference to them will, therefore, be found in the pages of this book. It was, however, necessary to mention them here, as, to many uninformed members of the gardening public, a "dwarf conifer" is understood to be one of those artificial Japanese dwarfs and nothing else.

On the other hand, the natural dwarf conifers, for the introduction of a great number of which the Japanese have also been responsible, are true garden plants, and, as such, have been grown in Continental and British gardens for many years.

Natural dwarfs may occur in many ways:

1. Probably the largest number of such forms have occurred in the seed beds of nurseries. Some conifers vary enormously from seed, and with species like *Picea excelsa*, which has been long known and frequently raised from seed, new forms are constantly appearing, showing variation in colour, height, and habit. When dwarf forms originate in this manner, they usually retain their habit irrespective of age.

2. Other dwarf forms result from environment. The self-sown seedlings of conifers on the higher mountains and in cold countries have naturally a harder fight for existence, and become stunted, and the more inhospitable and wind-swept the locality the smaller the trees become, until at length one gets either a prostrate shrub flat on the ground, such as the arborescent *Juniperus virginiana* becomes on the gale-swept cliffs of the coast of Maine in U.S.A., or else a low dense shrub, such as *Pinus cembra*—the Arolla Pine of the Swiss Alps—becomes in its stunted Siberian and Japanese representative, *Pinus pumila*. Such forms, notably stunted forms of the common juniper, occasionally revert to normal in lowland cultivation.

3. Other dwarf forms have originated from sports on branches of an otherwise normal arborescent tree. Most people have at some time noticed those curious nest-like conglomerations of branchlets that occur at times on trees, and are familiarly known as “witches’-brooms.” These are said to arise from several causes, either from some insect irritation or some constriction of sap; but whatever be the cause, the result is the abnormal mop-head-like growth, and it has been found that cuttings or grafts taken from such growths produce plants similar to the broom. Such plants, however, especially grafted plants, at times revert to normal trees. Examples of dwarf forms raised from such brooms are *Picea excelsa*, var. *tabuliformis*, and *Pinus Sylvestris*, var. *Beauvronensis*.

These natural dwarfs are the forms with which we are concerned.



A "WITCHES'-BROOM" ON NORMAL *PICEA EXCELSA*, AT
OLD MAXWELL NURSERY, GENEVA, N.Y.

My first business, and a very lengthy one it proved, was to search out and to collect together in my garden all the forms I could obtain at home and abroad, and compare them (a) with each other, and (b) with any recorded descriptions.

One result of my search was the discovery that many of the recorded forms were either no longer in cultivation or no longer procurable. Another result was the acquisition of a considerable number of forms—masquerading under well-known names—which did not correspond exactly with any recorded description; and when I came to search for descriptions of recorded forms, in many cases I found them absent, and in most cases totally inadequate. Nurserymen are notoriously careless about nomenclature, but in the case of dwarf conifers they have much to excuse them; for instance, a nurseryman could hardly be blamed if he sent out any dwarf form of *Picea excelsa* as “var. *brevifolia*,” for its description in Gordon’s “Pinetum” is merely “a distinct pygmy with small leaves”! Even Professor Beissner of Bonn, to whose researches we owe the recording of over 150 forms, and to whom all growers of dwarf conifers owe a debt of gratitude, greatly lessens the value of his wonderful and painstaking “Handbuch der Nadelholzkunde,” by similar inadequate descriptions, and also by omitting to state where the form described originated, or was to be found. Consequently, very many of the forms which he described can no longer be traced, and it is impossible to decide from some of his descriptions whether certain of his forms are identical or not with forms appearing in Nursery Catalogues under different names.

I have endeavoured, as far as possible, to rectify this by supplying, whenever I have had an opportunity of examining a form, a description of it sufficiently explicit to distinguish it, and also, in the case of rare forms not in general cultivation, by stating where, at the present time, a plant of it is to be found.

Where no such amplified description appears, it means that the form has so far been unobtainable, and I have simply given whatever description of it appears in the work of the author who records it.

As a further verification of identity, I had to trace, for comparison, old specimens still existing in Botanic Gardens and private collections, which from their age and origin were likely to be true to name, and in this I was unexpectedly fortunate, for I found a considerable number of specimens exceeding seventy years of age—planted, no doubt, during the 1850-60 boom. For instance, the original *Picea excelsa*, var. *Clanbrasiliana*, or a portion of it—now over 150 years old—is still growing in the Earl of Roden's Park at Tullymore, Co. Down; and in America at Geneva, N.Y., Professor Sargent and Mr. Dunbar traced portions of the original *Picea excelsa*, var. *Maxwelli* (long ousted in Europe by an impostor), and so on. So that one way and another I have been able to clear up many difficulties. Possibly I might have achieved more; but the war intervened in the midst of my researches, and the post-war conditions on the Continent are not favourable to the propagation of stock of this nature. Regel and Kesselrings plants at Petrograd are gone. Famous nurseries, like those of Hesse of Weener, Späth of Berlin, and Simon-Louis of Metz, have been short-handed and their stocks depleted or lost, and a few small nurseries in Austria and Russia are inaccessible—if they still exist. In all the circumstances I do not see much likelihood of further information being forthcoming, and I must only console myself with the fact that so much material had been collected before the war intervened.

Situation and Soil.—Wherever dwarf conifers are grown, they should be kept away from taller things. In the Arnold Arboretum, Harvard University, they are grown by themselves on a slightly sloping grass hill; a similar situation has been selected for them at Glasnevin Botanic Gardens in Dublin. Used judiciously in the Rock Garden

they are even more effective, the procumbent forms flowing down the face of a cliff, and the fastigiate or conical forms surmounting a cliff top or placed just at its foot. In the large Rock Garden at Curragh Grange, Co. Kildare, they have been utilised freely and show to excellent advantage. A wide shallow gully is covered with the glaucous green *Juniperus sabina*, var. *tamariscifolia*, a large red sandstone rock is partly covered by the procumbent blue-grey form of *Picea pungens*, on the edge of a miniature precipice a small fastigiate juniper stands, and so on.

Possibly the most ideal situation is an old sandstone quarry. I know of one such in the North of England. In every available chink and cranny a tiny conifer was planted, and left to its own devices, and the effect is indescribably charming. I grow them myself wherever I can find room for them, on lawns, and on rockwork. I also grow a certain number in pots, primarily to enable me to transplant them at any time of the year, but grown this way they come in very useful in other ways. I sink the pots in odd spots on the rockwork where the Alpines in flower at the moment are improved by the contrast. I fill up blank spaces on the shelves of the cool greenhouses with them, and they are also much appreciated indoors as pot plants. They could be used far more freely than they are for lawn planting. I have often noticed in small gardens a large corner occupied by a variegated laurel or similar large and spreading evergreen, and thought how much pleasure the owner of that garden would gain if he substituted for the variegated shrub, six to twelve dwarf conifers of varying colours and shapes. They would give him colour and interest winter and summer, and as a rule would harbour neither broken bottles nor cats! Their annual growth is so slow and so sure that one can plant them freely among flowers with the knowledge that they will not encroach, and wherever one puts them, provided they are not made to look ridiculous by being planted with

forest trees, they fit themselves into the scheme of the garden. This year I noticed a small pyramidal tree of *Picea excelsa*, var. *mucronata*, which was planted on a rise in the Rock Garden; it is about 3 feet high by 2 feet through (3 feet by 2 feet). All around it the ground was covered with the prostrate stems of the pink Bosnian pansy—*Viola Bosnaica*; a prostrate stem coming in contact with the boughs of the tiny spruce had pushed its way in and up, and had come out again and was flowering at the sides and top of the “tree,” in exactly the same manner in which a clematis will climb and flower on an arborescent tree, and the effect was exactly the same, on a microscopic scale. The gardener who gives personal thought to the arrangement of his garden will be surprised to find the number of spots in which a baby tree can be inserted with effect.

Useful as they are in the large garden, they reign supreme in the small garden. Mr. John Dunbar, of the Department of Parks, Rochester, N.Y., informs me that in many of the villa gardens around Geneva, N.Y., one may still find old specimens of the dwarf *Picea excelsa*, var. *Maxwelli*, that originated in Maxwell’s Nursery, and have remained in their new homes long after the nursery has disappeared—and this is only one form. There is scarcely a garden patch so small but that it would contain half a dozen tiny trees that would give their owner more pleasure in their possession than he could ever receive from the doubtful joy of owning one arborescent tree.

As to Soil.—Dwarf conifers are not very particular; most of them (except the junipers), like their bigger brothers, prefer any soil to a pure chalk soil; the majority of them thrive in any soil not too dry or too water-logged. With me, most of them seem indifferent, and grow equally well in a limestone soil, and on my raised peat rock beds. The spruces seem to like moisture, the junipers, sun. Forms with fine heath-like foliage, like some of the junipers and the “juvenile forms” (referred to later),

abhor biting winds, and must be given a wind-sheltered position.

In my climate—about 32 inches of rain and thermometer in winter usually down to about 8 degrees Fahr. (sometime in January), for a short spell—most of those tried have proved hardy. *Cupressus obtusa*, var. *Sanderi*, I think, is delicate, and I always cover it with heather branches. *Juniperus communis compressa* and some of the Japanese cryptomerias are also of doubtful hardiness, but the number of named forms is now so large that there is ample room for selection for all purposes, and many of the pygmies are themselves natives of wind-swept winter-cold regions, and consequently can defy the worst we can offer them.

Selection.—As to choice of varieties, one must be guided by the size of one's garden and the purpose for which we require the trees. The term "dwarf" conifer has been in the past rather loosely used to denote all trees that do not grow tall, thus including some prostrate forms that might, in time, cover a good-sized garden. However, these are exceptions; as a rule, 7 to 8 feet is about the ultimate limit of height of the strongest growing forms (arborescent trees of the same age should exceed 100 feet). One can select forms varying from that height down to a foot or less.

The little trees are found in many shapes; tiny fastigiate columns, compact cones, round ball-like shrubs; pyramids broad and narrow, and little bushes with flat tops; others with round umbrella-like tops; low round or humped cushions. Bushes regular and irregular, with neat compact evenly arranged branchlets and foliage, and with the same twisted and contorted like a tangled head of hair.

They also differ greatly in colour. Every shade of green will be found among them, likewise foliage of glaucous grey and blue, foliage all gold or silver, or splotted with either. Shrubs with young shoots all white; shrubs which, while retaining their leaves, change their colour in winter.

One must select coloured varieties with care, rejecting any that are not clear in colour or distinct in marking. It is a mistake to have too many. One should include a number sufficient only to break the monotony of universal green. Of glaucous blue forms, *Juniperus virginiana*, var. *Kosteri*, *Cupressus Lawsoniana*, var. *Fletcheri*, *Abies concolor glauca compacta*; and of golden foliaged forms, *Juniperus chinensis*, var. *aurea*, *Thuya occidentalis* "Rheingold," and *Chamæcyparis pisifera filifera aurea* may be selected.

Propagation—Grafting.—All dwarf conifers can be reproduced by grafting, but this method should not be adopted except as a last extremity; in the first place, grafted plants as a rule grow stronger than those on their own roots; in the next place, they are frequently affected in their growth, habit, and characteristics by the stock on which they are grafted. Carrière notes one case where a dwarf form of *Cupressus obtusa* completely lost its identity by being grafted on the Lawson cypress. In the third place, grafted plants more frequently revert to normal arborescent trees. Avoid grafting, then, if possible, and discourage your nurseryman from supplying you with cheap Continental grafts. Of course, the pines are difficult to grow without grafting, but there is no reason why one should ever have to put up with grafted spruces or junipers.

Cuttings.—Most of the conifers, spruces, yews, junipers, and firs can be easily propagated from cuttings; the majority of nurserymen will not tell you so; they prefer grafting, but some of the Continental nurserymen do it regularly. Späth of Berlin used to raise thousands of dwarf spruces yearly in this manner, and he was advertising them as late as 1914. I have raised young plants in this manner myself, and have struck *Piceas*, *Abies*, *Taxus*, *Juniperus*, *Sequoia*, *Cupressus*, *Pseudotsuga*, *Tsuga*, *Thuya*, and *Thuyopsis*; in fact, the only conifers that I do not recollect striking are *Cedrus* and *Pinus*.

I do not know what method the Continental nurserymen

adopt, but I strike my cuttings in sharp sand, both in autumn and spring, using either a single shoot of current year's growth with a "heel," or else a small branch with its accompanying branchlets, and a good percentage of both strike. In autumn such cuttings are put in a cool greenhouse or under square hand-lights. In spring they are placed under *cloches* in full sun and never allowed to dry, and they root fairly quickly.

Layers.—When cuttings are hard to get or not likely to strike readily, layering may be adopted. The majority of the plants being extremely low-growing, this is not a difficult matter; branches slightly snicked with a knife may be pegged down around the plant, or, better still (and always in the case of branches off the ground), pegged down into a good-sized pot; in the latter case, when the layer has formed its roots, it can be severed from the parent and the pot removed, and there is thus no risk in moving it. Pines and suchlike can be treated in this manner.

Juvenile Forms.—As in the descriptions which follow occasionally the expression "juvenile foliage" occurs, it may be as well to discuss juvenile forms generally.

Anyone who has raised plants from seed will recollect that the leaves which first appear differ considerably from those which the seedling later assumes. In the case of conifers, these first, or juvenile leaves, are as a rule gradually replaced by the adult foliage, but there are notable exceptions, especially among the junipers, some junipers retaining their juvenile foliage permanently and exclusively, and others continuing to grow odd sprays of juvenile with their adult foliage. But with the majority of conifers the juvenile foliage soon disappears, and of those which as a rule lose their juvenile foliage entirely, so far only among the cypresses, the thuyas and cryptomerias do we find rare seedling forms which permanently and exclusively retain their juvenile foliage. These "juvenile forms" are in several cases very similar in

appearance, and are easily confused. They are further confused by being nearly all called "*var. ericoides*," on account of their heath-like appearance. In some cases there is a second juvenile "state" in which the plant seems to have made an effort to change its juvenile for adult foliage, and not quite succeeded. This second, or intermediate state, in some cases approaches nearer to the normal adult foliage, and in others remains nearer to the original juvenile. One may more readily distinguish some of these forms from each other if the following points of difference be noted:

Thuya occidentalis, *var. ericoides*.—Juvenile form with heath-like foliage leaves borne in opposite pairs, some with tips incurved, ascending at a narrow angle to stem and rather far apart. Yellow-green in summer, dirty brown in winter; branchlets fine and inclined to "flop."

T. occidentalis, *var. Watereri*.—Similar in most respects to *var. ericoides*, but foliage and branchlets much smaller and finer, branchlets so fine as to cause many of them to ascend in spirals.

T. orientalis, *var. juniperoides*.—Juvenile foliage of a glaucous blue-grey or green. Leaves borne in opposite pairs, but closer together, and often at right angles, and inclined to recurve; branchlets more crowded and making a denser, rounder shrub, with many upright branches. Habit decidedly stiffer.

T. orientalis, *var. rosedalis compacta*.—Even denser and finer, making an upright broadly spherical shrub; foliage glaucous blue in summer, purple-brown in winter. Borne in twos.

Cupressus sphæroidea, *var. ericoides*.—Similar foliage, but shorter, wider, and rather stiffer; borne in twos or threes and much closer together. Mostly at right angles or with tips decurved. Habit stiffer and erect; branches not so ascending—many nearly horizontal. Colour glaucous green in summer, red to violet-brown in winter.

C. Nutkænsis, *var. ericoides*.—Leaves still stiffer with

stout acute apex; upper sides rather convex; decurrent bases overlapping; branchlets horizontal or decurving. Colour dull blue-green in summer, brown in winter.

C. obtusa, var. *Sanderi*.—Leaves still shorter and thicker; apex usually rounded and not acute; borne in threes, ascending or at right angles; branchlets disproportionately stout. Colour: in summer, glaucous *eau de Niel*; blue in winter—plum colour. Branchlets few and ascending.

C. pisifera, var. *squarrosa*.—Leaves very fine and small; borne in twos in opposite pairs—irregularly—ascending at right angles or decurving; branchlets very fine and crowded. Habit a dense upright pyramidal shrub. Pale green in summer, slightly yellowish in winter.

C. pisifera, var. *ericoides* and *squarrosa pygmæa* ("Arnold Arboretum" variety) are of doubtful origin (see pp. 52 and 49).

C. Lawsoniana, var. *squarrosa* (not in cultivation; recorded in 1906 by Mayr as a juvenile form making a light green pyramid with very fine small foliage).

A form of uncertain origin was sent to me as var. *squarrosa nana aurea*. Its leaves, which are very similar to the first juvenile leaves of *C. Lawsoniana*, are borne in threes, and occasionally in fours, irregular in direction, thin and about $\frac{1}{8}$ inch long; colour light yellow-green. This is not unlike reputed forms of *C. pisifera* and *C. sphæroidea*, and I hesitate to identify it with *C. Lawsoniana*.

Cryptomeria Japonica, var. *elegans*, will be found under that species.

These are the only juvenile forms of which I have found records. The "intermediate forms" (which are more distinct from each other) are:

Cupressus Lawsoniana, var. *Fletcheri*.

C. Lawsoniana, var. *ericoides*.

C. pisifera, var. *plumosa*.

C. sphæroidea, var. *Andelyensis*.

C. obtusa, var. *Keteleeri*.

Thuya occidentalis, var. *Elwangeriana*.

T. occidentalis, var. *Ohlendorffii*.

T. orientalis, var. *Meldensis*.

T. orientalis, var. *minima glauca*.

T. orientalis, var. *intermedia*.

Works of Reference.—The following is a list of the principal works of reference which have been consulted in preparing the material for this book:

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Beissner, L.: "Handbuch der Nadelholzkunde." Berlin, 1st ed., 1899; and last ed., 1909.

Carrière, E. A.: "Traité Général des Conifères." 1st ed., Paris, 1855; 2nd ed., 1867.

Dallimore, W.: "Holly, Yew, and Box." London, 1908.

Elwes, H. J., and Henry, A.: "The Trees of Great Britain and Ireland." 7 vols. 1906-13. Edinburgh.

Gordon: "Pinetum." London. Ed. of 1876.

Loudon, J. C.: "Arboretum et Fruticetum Britannicum." London, 1838.

Sargent, C. S.: "Arnold Arboretum Bulletins," vol. iv. 1918.

Sargent, C. S.: "Silva of North America," vols. x.-xiv. Boston, 1898-1902.

Kent in Veitch, J.: "Manual of the Coniferæ." London, 1900.

Wilson, E. H.: *The Garden Magazine*. Boston, 1920.

In the following descriptions the authority for the name and the first description of the form are, whenever they exist, invariably given; where no such authority is quoted, it must be assumed either that the form is being described for the first time or else that, owing to circumstances, which are usually stated, the form has had to be renamed. That the sorting, fitting, and refitting of names has been no easy task may be realised, when it is noted

that the number of dwarf forms dealt with by earlier writers is approximately as follows:

Loudon in 1838	..	..	..	10 forms
Carrière (1855-67)	..	..	..	40 „
Beissner (2nd ed., 1899)	..	..	..	100 „
Beissner (last ed., 1909)	..	..	..	160 „
The present writer	..	..	..	460 „

ABIES.

Having regard to the number of species and the length of time that some of them have been in cultivation, the silver firs have produced a curiously small number of dwarf forms. With the exception of the pendulous forms, only a few are obtainable or in cultivation, and only two or three of them are in the first rank. The pendulous forms as a rule grow either too high or else too strong, and the dwarf upright forms are inclined to revert to the arborescent type. *A. balsamea*, var. *Hudsonica*, *A. concolor*, var. *glauca compacta* and var. *pendula*, are the best I have met. There may be others equally satisfactory among those described, but they are not in general cultivation.

A. amabilis (Forbes) in nature grows up to 200 feet, but away from its native habitat (Oregon, British Columbia, and Washington) it has not proved a general success. It grows slowly, and occasionally remains quite low-growing.

At Brickenden Grange, Herts, Elwes and Henry record (vol. iv., p. 785) a dwarf form 1 foot high with spreading branches 12 feet long. This specimen is of great age, and it is suggested that the constant cropping of its leader by animals caused it to grow in this manner.

A. amabilis, var. *compacta*.

Another specimen in my possession was stated to be about twenty years old when I got it; it is evidently a side branch grafted; it has made an erect shrub, about 3 feet high and about as much through; it has made no

attempt to send up a leader, but its side branches are slowly and almost imperceptibly extending laterally. The annual growth of the branchlets is from $\frac{1}{2}$ to 1 inch, and the leaves are shorter than those of the type, being from $\frac{3}{8}$ to $\frac{3}{4}$ inch long.

A. balsamea, Miller.

The balsam fir is a native of North-East America, and was introduced to Europe by Bishop Compton in 1697. In its native habitat it varies from a tree of 60 to 70 feet high to a semi-prostrate mat on the timber line.

A. balsamea, var. **Hudsonica**, Sargent and Engelman
("Transactions of the Academy of Science," St. Louis, 1878).

Syn.: *A. Hudsoni*, Carr. ("Conif.," 271).

A. Fraseri Hudsonica, Carr. ("Conif.," ii. 200).

According to Engelman, this is a sterile dwarf form found above the timber line on the White Mountains in New Hampshire. It is uncertain (Elwes and Henry, vol. iv., p. 804; Sargent, "Garden and Forest," 1897) whether this is identical with *A. Hudsoni* of gardens; the latter, according to Sargent, is of unknown origin and probably a depauperate form of *A. balsamea*.

Beissner (p. 465) describes this form as a broad black-green bush, which remains absolutely low-growing, spreading over the ground. Leaves short, broad and flat; upper side black-green, under side blue-green. Beissner also describes (p. 465) another form—

A. balsamea, var. **nana**, Beissner (ii. 179).

Syn.: var. *globosa*, Hort.

According to his description, the only marked differences between these forms is the colour of the leaves, which in var. *nana* are lighter green above, and blue-white, not blue-green, below; var. *nana*'s leaves being nearer in appearance to the type than those of var. *Hudsonica*.

If Beissner's descriptions are correct, all the specimens that I have come across in cultivation are var. *nana*,

although many of them were sent out, not as var. *nana*, but as var. *Hudsonica*. Of seven specimens in my possession obtained from different sources, I note only one that appears to be in any way distinct; this I received as var. *globosa nana*; it is making a thicker, rounder head, and its leaves are slightly darker above; but underneath, its leaves, like those of every other specimen I have seen, are blue-white like those of *A. balsamea*. Since writing this, I have received further confirmation from Messrs. Den Ouden and Sons, of Boskoop, who have grown these forms for many years. They say: "We also cannot see any difference between *nana globosa* and *Hudsonica*. Over twenty years ago we used to get *Abies Hudsonica* from Belgium, and it was quite distinct. Unfortunately we no longer have it."

The following description is taken from specimens in gardens received under both names. Buds, small, globose; shiny red, resinous. Branchlets: annual growth about $\frac{3}{4}$ inch, smooth grey-yellow; small scattered pubescence. Leaves pectinately arranged in about three ranks at right angles to branchlet; flat; curved $\frac{1}{4}$ to $\frac{1}{2}$ inch, usually wider from centre to apex; upper side, shiny dark green, grooved and slightly convex; under side, raised green midrib separating two blue-white sunken stomatic bands. Resin canal marginal. A small spreading shrub, rarely 2 feet high; branches very numerous, forming a compact, tight, rather flattish head. Carrière records a specimen planted at Château Balene in 1838. Twenty years later it was 15 inches high and 5 feet diameter.

A. balsamea, var. prostrata, Carr. (i. 218).

Syn.: *Picea balsamea*, var. *prostrata*, Knight ("Syn. Conif.," 39, 1850).

A very low-growing dwarf form with numerous wide-spreading, scattered branches, otherwise like var. *Hudsonica*. Professor Sargent ("Arnold Arboretum Bulletins," 18, 1918) says that near the timber line of the White Moun-

tains it is possible to walk on dwarf mats of the Balsam Fir. The plant which Knight described was very possibly a form collected from such an altitude which subsequently reverted to normal. In any case, I cannot trace it in cultivation.

A. concolor, Lindley and Gordon.

A native of Colorado, Arizona, and California, and introduced to Europe by Lobb in 1851. According to Engelmann, it grows to 150 feet in height. Its foliage is very glaucous, and all its dwarf forms are attractive.

A. concolor, var. **glaucæ compacta**, Hort.

Buds and branches same as the type. Branchlets: annual growth 1 to 2 inches; stouter, stiffer, and closer together than the type. Ascending and arching at their tips. Leaves variable, straight, or falcate, thinner than the type, and from 1 to $1\frac{3}{4}$ inches long. Very glaucous. Makes an irregular shaped compact bush, inclined to grow lop-sided. At Curragh Grange, Co. Kildare, is one—an irregular flat-topped bush, 3 feet by 2 feet.

A. concolor, var. **globosa**, Niemetz ("Mitt. d. d. d. Ges.," 1905, 212).

Raised by Niemetz at Temesvar, Hungary. In 1905 this had made a globular bush, 70 cm. through, with shorter branches than the type.

A. concolor, var. **pendula**, Simon-Louis ("Mitt. d. d. d. Ges.," 1896, 64).

Buds, branches, and branchlets scarcely differing from the type, but branches and branchlets very pendulous, almost prostrate; leaves mostly sickle-shaped and very glaucous grey-green. This form was raised by Simon-Louis Frères at Plantiers, near Metz. With me it grows very slowly.

A. concolor, var. **violacea compacta**, Beiss. (1891, 479).

A seedling form, making a thickset roundish pyramid. Foliage very glaucous.

A. grandis, Lindl.

Inhabits Western North America; especially the North Pacific coast. It was introduced into Europe in 1831 by D. Douglas. It is found over 200 feet high in its native habitat.

A. grandis, var. **compacta**, Hesse.

According to Beissner this is a dwarf form very similar to *A. balsamea Hudsonica*.

A. grandis, var. **pendula**, Späth ("Mitt. d. d. d. Ges.," 1896, 28).

A pendulous form raised by Späth of Berlin which I have not seen.

A. lasiocarpa, Nutt.

Syn.: *A. subalpina*, Engl.

An Alpine fir from Western North America, from Alaska South to Utah, Colorado, and Oregon, where it is found up to 100 feet in height. It is not a good grower in the British Isles.

A. lasiocarpa, var. **Arizonica**, Lemmon (*Sierra Club Bull.*, ii. 1898, 167).

Syn.: *A. Arizonica*, Merriam.

The cork bark tree. Is a much smaller tree, found in the mountains of Arizona, 7,500 to 9,000 feet up. It is rare at present, but is worth growing for a while on account of its wonderful glaucous colour. It is a much smaller tree than *A. lasiocarpa*, and appears to be of slow growth. The dwarf varieties of *A. lasiocarpa* are not very good doers in European cultivation.

A. lasiocarpa, var. **conica**.

Syn.: var. *compacta*, Rehder (*Jour. Ar. Arb.* i., 1919, 55 [not Beissner]).

A broad conical bush of compact habit and crowding ascending branches; raised in the Arnold Arboretum from seeds sent there by Dr. C. C. Parry from Colorado in 1873. The plant is now about 6 feet high and as much through.

Buds about $\frac{1}{8}$ inch. Light brown, resinous. Branchlets glabrous or occasional fine scattered pubescence, thin. Annual growth $1\frac{3}{4}$ to $2\frac{1}{2}$ inches. Leaves very thin and fine, about 1 inch by barely 1 mm. wide; curved, pointing forward; under side nearly bare, very crowded above. Grey-green. Stomatic bands not nearly so strongly marked as type or var. *globularis*.

A. lasiocarpa, var. **Beissneri**, Hesse ("Mitt. d. d. d. Ges.," 1902, 46).

A curious distorted form found by Hesse of Weener, with sickle-shaped leaves curled and twisted round the distorted branchlets. I have seen no healthy specimens; the few I have seen were suffering from disease, and their swollen and gouty branches added to the extraordinary appearance of the plants. They were like stunted bushes from a Rackham drawing. I have one specimen—a small irregular bush with few branches—about 2 feet high.

A. lasiocarpa, var. **compacta** (not Rehd).

Syn.: *A. subalpina*, var. *compacta*, Beiss. (ex "Mitt. d. d. d. Ges.," 1900, 64).

A densely branched, fairly regular glaucous blue globular form. Beissner records one example raised by Herr Ordnung at Eisenberg in 1898, which at eight years of age was a globular bush 35 inches high; and another 3 feet in diameter.

Buds about $\frac{1}{8}$ inch long, cream-brown, resinous. Branchlets stout, stiff, and short. Annual growth about $1\frac{1}{2}$ to 2 inches. Pubescent. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, imperfectly radial; very crowded on top, few beneath; thick, stiff, straight, or slightly curved, rather over 1 mm. wide; uniform in width, ending in a round blunt apex. Glaucous blue-green. Leaves point out and slightly forward.

A. Nordmanniana, Spach.

Comes from Asia Minor and the Caucasus, where it reaches 200 feet in height. It was introduced about 1850.

A. Nordmanniana, var. **brevifolia**, Carr. ("Conif.," ii. 278, 1867).

A compact conical form, with thick stunted branches, and with leaves shorter, broader, and more crowded on the branchlet than the type.

A. Nordmanniana, var. **pendula**, Beiss.

Pendulous and semi-prostrate forms are found fairly frequently in cultivation, differing only in habit from the type.

A. pectinata, De C.

The Common Silver Fir. Came originally from Central and South Europe, where it grows up to 200 feet in height. Considering that it has been in cultivation over 300 years, it has produced very few dwarf forms.

A. pectinata, var. **tortusa**, Booth, Beissner (ii. 433).

Syn.: *A. pectinata nana*, Hort.

A. pectinata prostrata, Hort.

A. pectinata pumila, Hort.

Picea pectinata tortusa, Gordon ("Pinetum," 153).

P. pectinata nana, Knight ("Syn. Conif.," 39).

A dwarf form of irregular sparse growth, with crowded and twisted branchlets and irregularly shaped leaves.

A. pectinata, var. **brevifolia**, Carr. ("Conif.," ii. 282).

A distinct low-growing dwarf with leaves broader and shorter than the type; raised by Chrétien of Versailles.

A. pectinata, var. **microphylla**, Carr. ("Conif.," ii. 283).

A dwarf shrub. Branches short, numerous, thin, semi-erect. Branchlets enlarged at the base and compressed into a sort of muff. Leaves thin, very narrow, 8 to 15 cm. long, round obtuse apex. Buds small, red, resinous.

A. pectinata, var. **compacta**, Beiss.

A distinct seedling form raised in the S. B. Parsons Nursery, Flushing, N.Y., U.S.A., making a dwarf roundish

bush, broader than high; compact. Branches crowded, and very shiny green leaves.

In cultivation this form, according to Sargent, is apt to revert after a time and to become an arborescent tree.

A. pectinata, var. **pendula**, Beiss.

Syn.: *Picea pectinata pendula*, Gord. ("Pinetum," 153, 1858).

There are three forms in cultivation which apparently have not been separated: (a) Upright stem with pendulous branches. Beissner (ii. 120) records one of these at Freiburg, East Friesland, 30 feet high. (b) A low stem with horizontally spreading branches. (c) Practically prostrate with long branches that hug the surface of the ground or hang down a rock fall. I have a plant of the last quite prostrate, but strong in growth. Except in habit these forms do not differ from the type.

A. pinsapo, Boiss.

Comes from Spain, where it is found up to 100 feet in height, and introduced about 1840; its short blunt leaves, arranged radially, are very distinct.

A. pinsapo, var. **Hammondi**, Kent in Veitch ("Man. of Conif.," 105, 1881).

A distinct abnormal form with a low stem; branches long and stretching over the ground; branchlets and leaves shorter than those of the type.

A. pinsapo, var. **pyramidata**, Beiss. (ii. 139).

Is described as a low-growing form with ascending branches forming a compact cone.

A. Sibirica, Led.

Comes from Siberia. Introduced in 1820. It has not proved a success in cultivation in more Southern countries, owing to its liability to injury from spring frosts; none of its dwarf forms have found their way into general cultivation so far, so nothing can be said as to their value as garden plants.

A. Sibirica pumila, or **nana**, Schröder, Beiss. (ii. 18).

A small dense bush without a leading shoot.

A. Sibirica, var. **monstrosa**, Schröder, Beiss. (ii. 18).

A monstrosity with short tufted twisted branchlets which I have not seen.

A. Sibirica, var. **pendula**, Schröder, Beiss. (ii. 18).

A pendulous or semi-prostrate form, differing only in habit from the type.

CEDRUS, Lk.

C. Libani, Barr., has been in cultivation in Western Europe for about 400 years. **C. Atlantica**, Manetti, and **C. Deodara**, Lawson, each just under 100 years, and in this length of time there have been only four reputed dwarf forms recorded between them, and of these, all, except the pendulous form of *C. Deodara*, were produced by *C. Libani*.

C. Libani, var. **nana pyramidata**, Carr. ("Conif.," i. 234).

Described by Carrière as a compact, conical dwarf form with ascending, slender, crowded branches. He states that it is smaller and more compact than var. *nana*, and its branchlets are more erect and more slender.

C. Libani, var. **nana**, Loudon ("Ency. of Trees," 1058).

Syn.: *C. Comte de Dijon*, Carr. (ii. 371).

var. *Comte de Dijon*, Barbier (Catalog., 1908).

Plants under the name of var. *Comte de Dijon* have, of recent years, been sent out by English nurserymen, but almost invariably are found to be *C. Libani brevifolia* (q.v.). The true plant was sent out for a few years by Barbier and Son of Orleans, and the only plants from this source that I can trace are at Glasnevin Botanic Gardens, and in the Rock Garden of Mr. F. D. Cairnes, of Killester, Co. Dublin. Mr. Reginald Farrer refers to this form in one of his books, but I have been unable to ascertain the history of the tree in his garden at Ingleborough, Yorks. The Glasnevin tree is now about 3 feet high, and nearly as

much through near the base. It has made a compact pyramid of thickly crowded ascending branches. Annual growth of branchlets $1\frac{1}{2}$ to 2 inches, pubescent, very fine and supple. Leaves from $\frac{1}{2}$ to $\frac{3}{4}$ inch; very straight, fine and narrow—widest in middle and tapering to both ends, terminating in a sharp cartilaginous point. Carrière states that dwarf forms are not uncommon in the seed beds. He groups them all together under the name of var. *nana*, and adds that they usually form roundish, confused, but compact bushes rarely exceeding 3 feet in height. Barbier's plant differs slightly in shape and vigour, but not sufficiently to separate it.

C. Libani, var. *brevifolia*, J. D. Hook (*Journ. Bot.*, 1880, 31).

Syn.: *C. brevifolia*, Henry.

This tree is found in Cyprus, and is considered by some authorities to be distinct enough to be classed as a separate species. Even in its native habitat it must be extremely slow in growth, for Beissner (ii. 329) records old trees of 100 years of age only 30 feet in height. I have seen only small specimens in this country, and they appear to be of extremely slow growth. I have a few in my own garden making irregular bushes of somewhat arching or almost horizontal branches; branches and branchlets much stouter and stiffer than var. *Comte de Dijon*, and tiny leaves $\frac{3}{10}$ to $\frac{1}{2}$ inch, slightly incurved, disproportionately thick, roundish, uniform width, terminating abruptly in a short cartilaginous point.

C. Libani, var. *pendula* Sargent, Hort.

Syn.: var. *pendula*, Knight (?) ("Syn. Conif.," 42, 1850).

The pendulous variety described by Knight is, as far as I have been able to ascertain, no longer in cultivation, and the pendulous form, of uncertain origin, named after Professor C. S. Sargent, of the Arnold Arboretum, is apparently the only one now obtainable. This, in my garden, has made an upright stem of about $2\frac{1}{2}$ feet in

height, with branches growing at first horizontally, and then curving rapidly towards the ground, on the surface of which they extend in all directions. The branches are densely crowded, and the branchlets make an annual growth of from 2 to 3 inches. The leaves are thickly borne, and very long.

C. Deodara pendula, Beiss. (ex "Mitt. d. d. d. Ges.," 1900, 100-1).

Beissner describes a pendulous form of the Deodar which appears to be very similar in growth to the above, but I have not seen it.

CEPHALOTAXUS.

A group of low evergreen trees or shrubs closely allied to the yews, of which the only species which concerns us is *C. pedunculata*, Sieb., of which—

C. pedunculata, var. *fastigiata*, Carr. ("Conif.," ii. 717).

Syn.: *Podocarpus Koraiensis*, Sieb.,

is a slow-growing fastigiate form, similar in appearance to the Florence Court Yew; the branches and branchlets are few and sparse, ascending at a very narrow angle; the leaves are long—up to $2\frac{1}{2}$ inches—dark or grey-green, arranged radially and usually recurving. This form was introduced from Japan in 1861.

C. pedunculata, var. *fastigiata aureo-variegata*, Beiss. (ii. 66).

Beissner describes a variegated form introduced as var. *gracilis* by Christopher Van Geert, of Antwerp, in 1886.

He also mentions a dwarf form which I have not seen:

C. pedunculata, var. *nana compacta*, Froebel,
as a dwarf compact bushy form.

Hillier of Winchester lists a prostrate form:

C. pedunculata, var. *prostrata*,

which I have just obtained and which appears similar to the type in everything except habit.

CHAMÆCYPARIS, Spach.

Chamæcyparis Lawsoniana, Parl. (1864).

Syn.: *Chamæcyparis Boursieri*, Carr. (1867).

The Lawson cypress is a native of Western North America; it varies enormously from seed, and in the 80 or 100 years during which seedlings have been raised in Europe, endless named forms have been put into cultivation by Continental and British nurserymen. Some very distinct forms are to be found among them, but in many cases they are not sufficiently distinct to have merited a separate name. Of the thirty odd dwarf varieties described, rather more than half of them are obtainable at the present time; the remainder are mostly forms recorded by Beissner and seen, it is presumed, by him in Continental gardens and nurseries. His descriptions are occasionally very short, but from them one gathers that there are several distinct forms at present unobtainable. The Lawson cypress, unlike some Thuyas, retains its normal colouring all through the winter, which assures for any form of it a welcome.

C. Lawsoniana, var. *filiformis compacta*, Beiss. (ii. 548).

Syn.: var. *filiformis globosa*, Hort.

Branches crowded, spreading, crimson-brown. Branchlets cord-like, with very small appressed scale-like leaves with their tips free; branchlets drooping. Leaves minute, dark green, glazed. The foliage is not unlike that of *C. pisifera*, var. *filifera*, but is much finer and smaller.

This is the dwarf form of the variety *filiformis*, and it makes a crowded globular bush, its drooping branchlets giving it the appearance of a wet mop. It is not uncommon in cultivation.

C. Lawsoniana, var. *nana*, Gordon ("Pinetum," 88).

Syn.: var. *pumila*, Hort;
var. *intermedia*, Hort.

A slow-growing, dense, dark green globose form. Branches ascending. Branchlets stiff and crowded,

about 8 inches long by 2 inches wide. This form makes a round bush usually wider than high. There are old specimens at Woodside, Howth, and at Curragh Grange about 4 feet high by 5 feet through.

C. Lawsoniana, var. nana glauca, Beiss. (ii. 552).

Is rather denser and rounder, with glaucous blue-green foliage.

C. Lawsoniana, var. nana albo-variegata, Beiss.

Syn.: var. *alba maculata*, Hort.

There are two forms of this variety in commerce; the best, sometimes sent out as var. *alba maculata*, is a small compact conical bush of dark blue-green foliage tipped with clean white, the whole plant appearing white from a distance. The other is looser in habit; the branches less erect and branchlet tips pendulous; it is of a much paler green, and the white markings are a dirty cream-white. I have seen no old specimens of the former. An old plant of the latter form at Curragh Grange, Co. Kildare, is a roundish umbrella-like bush 4 feet high by about 3 feet through.

C. Lawsoniana, var. nana albo-spicata, Beiss. (ii. 352).

Is described as a compact conical plant with silver-white tips and darker inner foliage, giving the plant a shimmering appearance. I have never seen this form.

C. Lawsoniana, var. minima, Gordon ("Pinetum," 1878, 89; Beiss., ii. 79).

There appear to be two forms of this, one with light yellow-green and the other with glaucous blue foliage. Beissner describes them as "compact balls" of crowded branches, but all plants I have received or seen are broadly conical rather than globose. They are of slower and denser growth than var. *nana*, and the ascending branches and branchlets are inclined to twist sideways so as to present their edges to view, somewhat in the same manner as *Thuya orientalis* does. An average branchlet spray

measures about 6 inches long by 2 inches wide. The leaves are very small with blunt or rounded tips which are closely appressed to the branchlet.

C. Lawsoniana, var. nana argentea, Beiss. (ii. 78).

Syn.: var. *minima argentea*, Hort.

Beissner describes this form as a shimmering white globose dwarf. I recently received under the name of var. *minima argentea* a plant which seems to correspond to this description. It is a small, broadly ovoid bush, about 9 inches high. Branches and branchlets crowded, ascending at a very narrow angle and overlapping. Their spray is even smaller than that of var. *minima*, being about $4\frac{1}{2}$ inches long by 1 inch across. The leaves are finer than those of var. *minima*, more pointed, and their tips are free.

Although the branchlets are ascending and pressed tightly against one another, their tips are all pendulous or recurving. The colour of the older foliage is grey-green, and of the new foliage white-green. This unusual colour, together with the pendulous waving branchlet type, gives one the impression of "shimmering white" to which Beissner refers. This is a most attractive form.

C. Lawsoniana, var. nidiformis, Beiss. (ii. 552).

Syn.: var. *plumosa nidifera*, Hort.

C. Nutkænsis, var. *nidiformis*, Hort (in error).

A pretty, loose, bluish-green form. Branches horizontal, radiating from the centre (where the foliage is very dense). Branchlets arching, with pendulous tips. The foliage grows all round the branchlet tips, giving them a distinct appearance like the round tip of an ostrich feather. An average branchlet is 4 inches long by $\frac{3}{4}$ inch wide, the rounded tip being about 2 inches across. As a rule, in addition to the small secondary branchlets (about $\frac{1}{2}$ inch long) which grow from the sides of the branchlets and point forward, there are also, about half-way down the branchlet, two larger secondary branchlets

growing out at right angles, one on each side and opposite to each other.

I have, and have seen, only young plants of this form.

C. Lawsoniana, var. prostrata, Beiss. (79).

An absolutely prostrate form, raised in Eisenheim, Bohemia, by Ordnung, with grey-green foliage.

C. Lawsoniana, var. Fletcheri.

This variety originated in Messrs. Fletcher's Nurseries at Chertsey, and is now generally obtainable. It is a very slow-growing juvenile form with intermediate foliage. Branches red, ascending. Branchlets ascending at a narrow angle; both branchlets and foliage being of a wonderful glaucous green, which colour it retains all through the winter; branchlets very fine and densely crowded, from $\frac{1}{4}$ to 1 inch. Leaves in opposite pairs (intermediate, between juvenile and adult), ascending, flat; upper side slightly concave, with midrib; lower side slightly convex and keeled; tapering to apex, and slightly incurved from upper third to apex; length under $\frac{1}{8}$ inch. The oldest plants in cultivation are making small fastigiate or narrowly pyramidal bushes, compact and very dense. This is certainly one of the finest glaucous conifers in existence, and is equal in colour to the best forms of *Cedrus Atlantica glauca*, and so far it seems less susceptible to cold winds than other juvenile forms.

C. Lawsoniana, var. tamariscifolia.

A distinct dwarf form raised by Smith of Darley, near Matlock. Branches ascending. Branchlets absolutely irregular, twisting and turning in every direction. Some straight, some pendulous, some curved. The branchlets are not very crowded, but from a distance they appear to be so, owing to the irregularity of their habit. The plant makes a low umbrella-like bush, from which the irregular branchlets project in all directions. The scale-

like foliage is very thin and flat, and the leaves are not appressed to the stem the whole way, but are free from about half their length to the apex; the free portion is about $\frac{1}{18}$ inch long, and points out and forward at an angle of about 45 degrees, and tapers rapidly to a long and somewhat sharp point. Colour a distinct grey-green. My best specimen is about 2 feet high by 3 feet across.

C. Lawsoniana, var. Darleyensis, Kent (ii. 208).

Syn.: var. *nana aurea*, Hort.

I have a plant under this name also said to be raised by Smith of Darley. Branches and branchlets somewhat similar to var. *nana* in size; foliage lightly tinged with golden-yellow; habit very loose; branches being few and ascending, and not stiff; branchlets rather pendulous.

C. Lawsoniana, var. conica, Beiss. (1st ed., 1891).

Syn.: var. *Wisselii*, Hort. ("Mitt. d. d. d. Ges.," 1897, p. 56).

This in time becomes too large to be termed a dwarf form, but it is of sufficiently slow growth to be included. It is strikingly distinct, its foliage being minute and fern-like, and of a wonderful glaucous blue-grey, but its branches are few and inclined to get "leggy," and it pays to keep it in shape with judicious use of the knife. The branchlets and foliage are rather like those of *C. obtusa*, var. *filicoides*, but stouter, the foliage being very crowded and overlapping; the secondary branchlets being opposite and growing in two ranks, alternate pairs pointing slightly up and slightly down; branches inclined to twist; foliage very densely packed on the branchlets; very short and stiff, forming stiff pyramidal or cockscomb-like growths on the branchlets.

Beissner (ii. 551) states that it was raised by Herr Gebbers in Weissenburg, and was a seedling of var. *fragrans argentea* of Kew. It makes a conical bush. It was introduced into commerce by Dutch nurserymen under



CHAMÆCYPARIS LAWSONIANA, VAR. FLETCHERI.

the name of var. *Wisselii*; but had been described considerably earlier by Beissner as var. *conica*.

C. Lawsoniana, var. Milfordensis.

A slow-growing form, the dwarfest of the "blue" forms—almost as blue as var. "*Tromphe de Boskoop*," making a narrow pyramidal bush, of close-growing ascending branches. The secondary branchlets are about 5 inches long by $2\frac{1}{2}$ inches wide, and are very regular; fine and shaped like a fern frond. My best plant is about 4 feet by 2 feet through.

C. Lawsoniana, var. squarrosa, Mayr (Beiss., ii. 543).

Beissner ex Mayr ("*Fremdl. Wald.*," 1906, p. 406) records this juvenile form as a light green pyramid covered with fine small needle-like foliage, and states that it is not now in cultivation; but I received some years ago a plant of uncertain origin under the name of *C. Lawsoniana squarrosa nana aurea*, which may possibly be a form of *C. Lawsoniana*, but in absence of any information as to its origin, I hesitate to identify it with that species.

I have compared it with seedlings of *C. Lawsoniana*, and its foliage seems identical with theirs in all respects. Branches and branchlets very thin, fine and crowded, and ascending at a narrow angle. Annual growth $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches. Leaves in threes or fours set very close together; some pointing up with their tips slightly incurved, others pointing out, tapering to a long point about 4 mm. long by 1 mm. broad; under side slightly convex with almost imperceptible keel; upper side nearly flat. A small, fairly stiff, upright, rather flat-topped bush with very crowded branchlets, of a golden colour which it retains unchanged in winter.

C. Lawsoniana, var. ericoides, Kent ex Veitch ("*Man. Conif.*," 1900, 206).

A juvenile form, occasionally with awl-shaped foliage borne in threes, but usually with intermediate scale-like

foliage of a bright shining grass-green colour, very glaucous underneath. Leaves scale-like, very minute, $\frac{1}{16}$ to $\frac{1}{8}$ inch, in opposite pairs, not appressed but free, and sticking out. Extraordinarily crowded on the branchlets and overlapping. The whole having a heath-like appearance. Branches crimson-brown, stiff branchlets, very crowded and ascending, green to brown. Sprays 3 to $3\frac{1}{2}$ inches long by about 1 inch wide. Leaves straight or curved, mostly pointing forward at angle of about 45 degrees; narrow, terminating in a sharp point; upper sides concave, with a narrow glaucous stomatic band sunk between raised and enlarged margins; lower side convex, compressed, and sharply keeled. A very distinct juvenile form, extremely rare in cultivation.

C. Lawsoniana, var. Knowefieldensis.

A low shrub of arching branches and pendulous branchlets. Branchlets very thin and supple, dark brown. Leaves borne in sprays about 2 inches long by 1 inch; very thin and fine; minute, scale-like, with tips free; very dark blue-green above, very glaucous beneath. This form was raised in Messrs. Little and Ballantyne's Nurseries in Carlisle. Its foliage, which is of a very pleasing colour, approaches that of var. *tamariscifolia*, but differs from that variety in colour and also in habit, its branchlet sprays being widespread and regular—not overlapping and twisted.

C. Lawsoniana, var. juniperoides, Kent (Veitch, "Man. Conif," 1900, 206).

Syn.: var. *ericoides*, Hort (not Kent).

There is at Leonardslee, Sussex, in the collection of the late Sir Edmund Loder, a distinct and graceful dwarf form grown as var. *ericoides*, which is not var. *ericoides* of Kent. I have also received it from several nurserymen under this name. Its foliage is all adult, differing from that of vars. *nana* and *minima* only in size, shape, and arrangement of its scale tips. In the two first-named varieties,

the leaves, though very minute, are comparatively broad and round, and shaped like a J nib; the leaves are tightly appressed to the stem of the apex—the nib point is slightly incurved, the tip pressing hard against the stem. In the Leonardslee plant the leaves are half as small again, and narrower, tapering gradually from base to apex, not suddenly cut away on each side like a nib; they lie loosely up against the stem, and the apices of the leaves at the ends of terminal shoots are usually not touching the stems but free. The branchlet sprays are much finer and flatter than those of vars. *nana* or *minima*, and instead of being shaped like a goose feather, are wider near the tip than in the middle. The sprays are from 4 to 6 inches long by 2 to 2½ inches at their widest.

The plant has made a small pyramid, and its general appearance at first sight is very like that of the dwarf forms of *Juniperis sabina*, and I would suggest that it is probably *C. Lawsoniana*, var. *juniperoides*, Kent (Veitch, "Man. Conif.," 1900, 206), which he describes as having "growths very slender with minute leaves resembling those of a Savin juniper"; but he adds that the "axial growths are conspicuous by their yellowish tint." This does not seem to be the case on the specimens sent to me from Leonardslee.

C. *Lawsoniana*, var. *lycopodioides*, Beiss. (ii. 551); Tott (ex "Mitt. d. d. d. Ges.," 1896, 54).

A most extraordinary form; possibly the most distinct of all varieties of the Lawson cypress. If a normal young branch spray of any other of its forms be examined, it will be observed that the main central stem of the branchlet, where the growth is young, consists of a thin green stem covered with long leaves in opposite pairs and appressed to the stem for practically their whole length, the leaf tips alone being sometimes free. These pairs of leaves are set far apart from one another, the decurrent bases of one pair issuing from the tips of a lower pair, and

from this central branchlet spring the side fern-like branchlet sprays. In var. *lycopodioides*, however, these fern-like side branchlets are entirely absent, the whole foliage consisting of collections of stems with appressed leaves on them similar to the central stem, and these stem-like branchlets are twisted and curled and tangled in every direction. Their colour is a glaucous blue-green, and the under side of the leaf tips (which in this form are always free) is very white. The leaves all point forward along the stems, and are about $\frac{1}{2}$ inch long. The annual growth of the branchlets is about $1\frac{1}{2}$ by 3 inches.

This form, I believe, originated in the Tottenham Nurseries, Dedemsvaart, in Holland; it makes a conical irregular shrub. I have one about 2 feet 6 inches high by 20 inches through.

C. Lawsoniana, var. gracilis nana, Beiss. (ii. 549).

A roundish dwarf form, with fine, light, pendulous pale green foliage, which I have not seen.

C. Lawsoniana, var. compacta nova, Beiss. (ii. 551).

A compact, conical form, in habit like *Thuya occidentalis* Wareana, with crowded, fan-shaped fresh green foliage.

C. Lawsoniana, var. Krameri, Beiss. (ii. 552).

A curious dark green globular form; branches very irregular, some contorted; branchlets cord-like.

C. Lawsoniana, var. Shawii, Beiss. (i. 78).

A regular light green, loose-branched globular form. The branchlet sprays are wide and set slightly edgeways. There is a fine example of this form at Glasnevin; it has made, on a bare stem of some $2\frac{1}{2}$ feet in height, a large globular bush with a high pointed centre, resembling a cupola; about 4 feet 6 inches high by 4 feet through.

C. Lawsoniana, var. nana glauca, Beiss. (ii. 552).

Syn.: var. *Nana compacta*, Hort aliq.

A very handsome blue-green globular form.

C. Lawsoniana, var. **Weisseana**, Beiss. (ex Möll., "Deutsch. Gartnz.," 1890, ii. 554).

A very decorative form which Herr Hansen found in Pinneberg; an old plant 1 metre high by $2\frac{1}{2}$ metres through; was shown in Berlin in 1890. It makes a flat umbrella-like bush with pendulous branch tops.

C. Lawsoniana, var. **Raievskyana**, Lieb. (Möll., "Deutsch. Gartnz.," 1901; Beiss., ii. 554).

Raised by Lieb. in Partenit, South Russia, from var. *fragrans* (Kew), a form with widespreading branches; elegant pendulous branchlets and light green silvery foliage. The fourteen-year-old mother plant was 1 metre high by 2 metres through in 1909.

C. Lawsoniana, var. **Forsteckiana**, Beiss. (i. 79).

There is some difficulty in identifying this plant, as, although it appears occasionally in Continental nursery catalogues, I have never received a plant under this name that absolutely coincides with Beissner's descriptions. He says that it is a dwarf monstrosity coiled into a short compact ball like a hedgehog, similar to *Juniperus echiniformis*; its origin can hardly be recognised; and that it is propagated either in the form of little "balls" lying close on the ground, or as small trees surmounted by "balls." As received from good Continental nurseries, it is a plant not unlike var. *minima glauca* at first sight, but denser and dwarfer, its sprays being never larger than 4 inches by 1 inch, and its branchlets, instead of being single and erectly fan-shaped, are usually densely whorled and twisted with cockscomb-like heads. In a note to *C. obtusa*, var. *pygmæa* (ii. 563), Beissner mentions that Carrière noticed that this form of *C. obtusa* lost much of its character when grafted on *C. Lawsoniana* instead of being propagated from cuttings, and it is quite possible that grafting var. *Forsteckiana* has also changed its character, as "var. *Forsteckiana*"—of the trade—cannot be identified with any other recorded form. I am

endeavouring to propagate it now from cuttings in order to ascertain whether it will retain its existing form or revert to Beissner's dwarf "balls."

C. Nutkænsis, Spach.

Syn.: *Cupressus Nootkatensis*, Lamb.

Thuya excelsa, Bong.

Thuyopsis borealis, Carr.

The Nootka cypress inhabits North-West America—British Columbia, Alaska, and south to Oregon. It is extremely hardy, and although introduced as long as the Lawson cypress, it has never been cultivated to the same extent, which possibly accounts for the fact that there are so few dwarf forms of it recorded. Its branchlets are quadrangular and pendulous.

C. Nutkænsis, var. *ericoides* ("Mitt. d. d. d. Ges.," 1904, ex Beiss., ii. 536, 89).

A distinct seedling found by Herr Von Saghy in Kamon, Hungary. A juvenile form. Leaves radial, linear, pointed; set fairly close together, terminating in a needle-like point; rather thick; upper side blue-green, under side keeled; 5 to 8 mm. long by 1 mm. broad.

This is another apparently fixed juvenile form, with characteristic heath-like foliage. Its leaves are stouter than those of any other form under the name of "var. *ericoides*," except those of the juvenile form of *C. obtusa*.

C. Nutkænsis, var. *compacta*, Beiss.

Syn.: *Thuyopsis borealis compacta*, Hort.

Beissner describes this as a pretty, compact thick bushy form making a rather loose blue-green globular bush. There is a form of this with light green foliage known as var. *viridis*. In my garden it has made a compact narrowly oval upright bush about 4 feet high by 18 inches through. Branches and branchlets very crowded, ascending and compressed branchlet sprays with tips recurving. Colour blue-green.

C. Nutkænsis, var. *gracilis*, Beiss. (ii. 540).

Syn.: var. *compressa*, Hort.

According to Beissner this is a small, interesting, crowded branched, dwarf globular form. If it is distinct from var. *compacta*, it does not appear to be in cultivation.

C. obtusa, Sieb. and Zucc. (1847).

Syn.: *Retinospora obtusa*, Sieb. and Zucc. (1842).

Cupressus obtusa, C. Koch (1873).

Thuja obtusa, Benth. and Hook (1881).

The Japanese or Hinoki cypress was introduced into Europe by J. G. Veitch in 1861, but has long been a favourite conifer among Japanese gardeners, who have cultivated and propagated most of its abnormal forms; its blunt leaves, with their rounded apices outlined with a very white glaucous line, makes the type easily recognisable, and amongst the varieties described will be found some of the most distinct and desirable of dwarf conifers. Many of these are found in gardens under the name of *Retinospora*, or *Retinispora*.

C. obtusa, var. *pygmæa*, Carr. ("Conif.," ii. 131, 1867).

Syn.: *Retinospora ob. pygmæa*, Gord. ("Pinetum," 94, 1862).

Thuja pygmæa, Veitch (not Hort).

Branches fan-shaped, spreading close to the ground; almost horizontal. Branchlets brown-red with tips slightly pendulous. Foliage scale-like and stiff; shiny brown-green. Branchlets inclined to grow out sideways rather than forward, and set fairly far apart. The whole making a fairly open, slow-growing, flat-topped, round bush.

This form—the true var. *pygmæa*—has been known in European gardens more than half a century, and in Japanese gardens for a much longer period. It is extremely slow-growing. Very old plants are in cultivation, and are rarely more than 18 to 24 inches in height. My best specimen is 20 by 26 inches.

C. obtusa, var. compacta, Beiss. (ii. 562).

Similar to the type except in habit, making a dwarf compact conical bush, with short branches, and very crowded branchlets.

C. obtusa, var. nana densa, Hort.

Syn.: var. *Nana gracilis*, Beiss. (ii. 562).

A much denser form than the above. Branches and branchlets very crowded and overlapping; fan-shaped and twisted, and in more or less irregular, cup-like layers; foliage flat (occasionally four-sided) and scale-like, very dark lustrous shining green above and glaucous beneath. On old specimens occasionally still more crowded cockscomb-like growths appear on the branch tips somewhat similar in appearance to the foliage of var. *cæspitosa* (q.v.).

This form makes an erect crowded little shrub, often rather wider at the head than at the base; it is very slow-growing; the branchlet sprays being only about $2\frac{1}{2}$ inches long by 2 inches wide. At Curragh Grange a plant having the foliage of this form has made a low, dense, flat-topped bush of many upright branches about 18 inches high by 2 feet across.

C. obtusa, var. nana, Carr. ("Conif.," ii. 131).

A form very near to var. *nana densa*, but branchlets not twisted and set rather farther apart, not so crowded and barely overlapping; differing also in shape, making a spreading pyramidal bush; foliage similar to that of *nana densa*, but not so dark in colour. At the Arnold Arboretum a very old plant of this form is now a pyramidal bush 8 feet high.

C. obtusa, var. nana aurea.

From the general appearance of young plants, this would seem to be but a coloured variation of the above—

a flat-topped, compact bush with fan-shaped golden-yellow foliage, but Beissner records an old specimen at Boskoop, Holland, which has grown into a small columnar bush.

C. obtusa, var. **nana albo-variegata**, Beiss. (ii. 563).

Syn.: var. *Mariesi* (?), Hort.

Beissner separates this from var. *Mariesi* of gardens, but any plants I have seen or acquired under these names seem identical, and make slow-growing conical or pyramidal bushes with foliage similar to var. *nana*, whitish in summer and yellow-green in winter. A variety at Glasnevin, var. *argentea* of Veitch, seems rather a better colour. Branchlet sprays about 3 by $2\frac{1}{2}$ inches. A specimen I got under the name of var. *Mariesi* is now 3 by 3 feet.

C. obtusa, var. **pygmæa aureo-variegata**, Beiss. (ii. 564).

Stated by Beissner to be a variegated form of var. *pygmæa*. I have never seen it.

All these forms of *C. obtusa*, with the exception of var. *pygmæa*, vary very little in colour and in the size of their branchlets and foliage, but they are fairly distinct in habit. Var. *pygmæa* differs from the others in colour as well as in habit.

C. obtusa, var. **ericoides**, Böhmer (in Catalogue of 1900).

Syn.: *Juniperus Sanderi* (Gard. Chron., 1899, i. 287).

Retinispora Sanderi, Sanders (Gard. Chron., 1903. Suppl. April 25).

A fixed juvenile form; stouter and stiffer than any of the juvenile forms of *Thuya* and *C. sphæroidea* and *C. Nutkænsis* recorded. Branchlets at right angles or ascending, disproportionately stout. Annual growth about $\frac{3}{4}$ inch. Leaves in threes or twos, set close together; short—about $\frac{1}{8}$ inch—and stumpy, pointing out and slightly forward; apex rounded and sometimes

slightly incurved; under side convex; upper side nearly flat.

I recently received a photograph of a very fine specimen of this form growing in Mr. Walter Hunnewell's Pinetum at Wellesley, Mass. There it has made a dense pyramidal bush about 4 feet high by as much through. This is by far the best specimen that I have seen. It is extremely slow-growing; is not particularly hardy in my garden; and makes a small irregular bush, but its colour is so distinct that no collection can afford to omit it.

In summer its foliage and branchlets become a wonderful glaucous sea-green or blue, and in winter they take on the bloom and colour of a crimson plum. It seems to suffer more from cold winds than actual frost, and should be planted in a sheltered spot. It has been killed by frost at Orleans, but has withstood cold down to 4° F. in my garden with shelter.

It was first imported from Yokohama by Böhmer in 1894, and found its way to England soon after finding its way into commerce, and was described first under the name of *Juniperus Sanderi* (1899—*Gard. Chron.*, p. 287). About the same time Louis Böhmer and Co., of Erfurt, catalogued it as *C. obtusa*, var. *ericoides*, but it continued to be distributed as *Juniperus* and then as *Retinispora Sanderi*.

C. obtusa, var. nana prostrata.

A form I have only recently received. Foliage, branches, and branchlets similar to var. *nana*, but branchlet tips very pendulous. It is said to cover the ground with wide-spreading mat-like branches.

C. obtusa, var. tetragona.

Syn.: *Retinispora tetragona*, Barron ex Gordon
("Pinetum," 29, 1875).

R. thuyæformis, R. Smyth ex Gordon.



CHAMÆCYPARIS OBTUSA, VAR. SANDERI, AT WELLESLEY
PINETUM, MASS.



CHAMÆCYPARIS OBTUSA, VAR. TETRAGONA AUREA, AT
CASTLEWELLAN, CO. DOWN.

A dwarf, compact, slow-growing conical shrub. Branches ascending; branchlets crowded, short, irregular; branchlet tips congested and sometimes cockscomb-like. The secondary branchlets short, crowded, four-sided, and very bright green. Leaves oval, pointed, closely and regularly imbricated in four rows of a beautiful glossy bright green; the secondary side branchlets make a decurving hand-shaped spray of three or four opposite pairs of short branchlets with a central long one, and, as all are decurved, a branchlet viewed from one side looks not unlike a shrimp with its legs extended.

This very distinct form was introduced to England, according to Gordon, by Barron of Elvaston Nurseries and Smyth of Worcester, who imported it from Japan. In the 1875 edition of the "Pinetum" Gordon mentions the fact that Barron had a form with foliage "tipped with rich gold," and, curiously enough, it is this form, var. *tetragona aurea*, which is now in cultivation. In exposed situations the lower portions of its branchlets lose their leaves. The finest specimen I have seen is growing in the Arboretum at Castlewellan, Co. Down. There, in rich soil and in a very sheltered spot, it has made a pyramidal shrub over 5 feet high and about 15 feet in circumference, every branchlet clothed in foliage from base to apex. The green form I can no longer trace in any garden or nursery list. This plant transplants very badly, and should, if possible, be obtained only out of pots. Messrs. Barron inform me that they have lost the green form.

C. obtusa, var. *tetragona minima*.

Syn.: var. *Pygmæa*, Hort (not Carr.);
var. *minima densa*, Hort.

A minute, dense cushion of light green foliage, sixteen-year-old plants being only a few inches high by about half as many more across. Sending out a dense mass of ascending branches about 1 inch long, bare at their base,

the minute branchlet sprays appearing at the upper ends at a narrow angle to branches and pointing in every direction, making a dense round cushion. Branchlets inclined to recurve, branches and branchlets tetragonal, bearing minute scale-like intermediate leaves, not appressed like those of var. *tetragona*, but loose and free; their apices not blunt, but pointed and at times incurved.

One of three distinct and most interesting seedling forms raised in the nurseries of Messrs. W. H. Rogers, of Bassett, Southampton. Said to be seedlings of var. *nana*, but more probably of var. *nana densa*.

C. obtusa, var. cæspitosa.

This is another of Rogers' seedlings; it approaches var. *nana densa*, and, in fact, may be described as a smaller and denser form of that variety. It makes a tiny, extremely dense tuft, or series of tufts, so tightly packed together as to present the appearance of a solid ball of green. The small branches are inclined to "cup" like those of var. *nana densa*, and the tightly appressed scale-like leaves are similar in shape and arrangement to those of that variety, but are barely half their size. The branches and branchlets are proportionately small. My "specimen," which is stated to be sixteen years old, is only about 3 inches high by 4 inches through.

C. obtusa, var. juniperoides.

This is the third of Rogers' seedlings, a minute form of far more open habit, branchlets set farther apart, fan-shaped and decurving. If the specimen sent to me as sixteen years of age and about 4 inches by 4 inches is anything like that age, it will be a much smaller plant than var. *pygmæa*, Carr., but approaching near to it in habit; its branchlets and leaves, however, are considerably smaller and not so flat, and its scale-like leaves are narrower, more pointed, and their tips, which are incurved,

are not appressed, but mostly free. The narrow branchlet sprays are not unlike those of a Savin juniper and still more like those of *C. Lawsoniana*, var. *juniperoides*.

These are three extremely interesting forms, but I am not satisfied as to the age of the specimens in my possession. Messrs. Rogers have given me all the information at their disposal, but it is not very clear. Apparently there are over a dozen plants of each form in the nursery of the same age. I have not seen them, but as they are said to be identical, it is highly improbable that they were identical seedlings. It is probable that there were originally three "mother plants," one of each form, from which the existing plants were propagated; and from their roots and general appearance I should judge my specimens to be at most five years propagated, but until they have become established and their rate of growth noted it is not possible to estimate their ultimate size.

C. obtusa, var. **lycopodioides**, Carr. ("Conif.," ii. 132, 1867).

Syn.: *Retinispora lycopodioides*, Gord.

R. monstrosa, Hort.

Leaves variously shaped and densely arranged all round the shoots. Upper ones terete or bluntly awl-shaped. Keeled over back and arranged spirally. Those near base of principal shoots more or less scale-like, appressed in opposite pairs. Keeled on back; oval, imbricated; glossy dark blue-green. Branches spreading and rather slender. Branchlets scattered and irregular and very densely crowded, especially towards the ends of the branches, and there frequently flattened into a cockscomb-like head.

The whole forms a crowded, somewhat irregular pyramidal dwarf, with striking dark blue foliage. This particular form was introduced from Japan in 1861 by J. G. Veitch, and is common in cultivation, but since then several variations of it have been introduced.

One, var. *Troubetzkoyana*, in the garden of Prince Troubetzkoy on Lago Maggiore, seems intermediate between var. *lycopodioides* and the type.

Others mentioned by Beissner (ii. 561) as having been introduced into Germany from Japan by Böhmer are named: vars. *Rashahiba*, *Kanaamihiba*, *Shamohiba*, *Coralliformis*, *aurea*. From their descriptions all these appear to be variations of var. *lycopodioides*, but I have not seen any of them except var. *aurea*, which was sent to me by an English nursery as var. *lycopodioides* (type). At Curragh Grange, Co. Kildare, are several old specimens of the type, about 4 feet high.

C. obtusa, var. **filicoides**, Regel ("Russ. Dendr.," ed. 2, 27, 1883).

Syn.: *Retinispora obtusa filicoides*, Gord. ("Pinetum," 863).

R. filicoides, Veitch.

R. Nobleana, Hort.

Branches long, narrow, flat; regularly and thickly furnished on both sides with very short compound branchlets of same size all along their whole length. Branchlets short, quadrangular; deep green above, glaucous beneath. Leaves small, oval, curled, thick, obtuse, keeled on back; imbricated in four rows; very deep glossy green.

Introduced from Japan by J. G. Veitch in 1861, and now in general cultivation. Grows fairly big in time, but grows slowly and forms a rather flat, crowded, fern-like bush, with arching branches.

Beissner (ii. 558) records two varieties of this which I have not seen: var. *filicoides aurea* ("Mitt. d. d. d. Ges.," 1906, 156)—a golden foliaged form; and var. *aonokujahukiba*, K. Onum (in same, p. 68)—a form with longer, slenderer branches bearing rather short (from 1 to 3 cm. long) crowded monstrous side branchlets, giving the branches the appearance of arching fern fronds.

C. pisifera, Sieb. and Zucc. (1847).

Syn.: *Retinospora pisifera*, Sieb. and Zucc. (1842).

Cupressus pisifera, C. Koch.

Sawara (Jap.).

The Sawara Cypress was introduced from Japan by J. G. Veitch in 1861. The habit of the type is open and rather thin; its leaves are more pointed than those of *C. obtusa*, the pointed tips being free; and it is not a common tree in gardens, but some of its forms, especially the juvenile forms—vars. *squarrosa* and *plumosa*—are among some of the best-known garden plants, being found in any size, from window-box plants and tub plants to small pyramidal trees. These stand pruning very well, and can be kept to shape and in good condition by a judicious use of the knife.

C. pisifera, var. **filifera**, Beiss.

Syn.: *Retinospora filifera*, Standish and Gordon ("Pinetum," ii. 364).

Branches open and spreading with secondary ones, alternate; long, distant, and furnished with varying lengthened branchlets, the intermediate branchlets being long, slender, undivided, filiform, 8 to 10 inches, with tufts at points, laterals rather short and somewhat flattened; bright green above, glaucous beneath. Leaves ovate, very acute and spiny pointed; loosely imbricated; open and spreading at the points; backs keeled; decurrent at base; bright green above, glaucous beneath.

Its habit is rarely pyramidal; usually a broad low bush of pendulous branchlets. Common in cultivation.

Var. *filifera aurea* has its young growth yellow, and is slower in growth; it looks best when planted behind a low rock over which its branchlets may droop. Var. *flava*, Schelle (Beiss., ii., 573), was apparently raised from a sulphur-coloured sporting branch by Herr Schelle in Tübingen.

Beissner (ii. 573) records an even slower-growing form

—var. *filifera nana*, Hesse (“Mitt. d. d. d. Ges.,” 1904, 145), a green thick bushy form which at twenty-five years of age was 70 cm. high by 1 metre broad.

C. pisifera, var. **squarrosa**, Beiss. and Hochst. (Beiss., ii. 566).

Syn.: *C. squarrosa*, Sieb. and Zucc. ex Endl. (“Syn. Conif.,” 1847).

C. squarrosa leptoclada, Endl. (“Syn. Conif.,” 65).

C. squarrosa Veitchei, Hort.

Retinospora squarrosa, Sieb. and Zucc. (“Fl. Jap.,” ii. 1842).

R. squarrosa glauca, Hort.

R. squarrosa leptoclada, Sieb., Gord. (“Pinetum,” 297).

R. leptoclada, Zucc. ex Gordon (“Pinetum,” 1862) (not Hort.).

This is a fixed juvenile form of *C. pisifera* introduced by Veitch from Japan in 1861, and forms a bushy pyramidal plant, with ascending branches and branchlets, with pendulous tips covered with glaucous silvery-green awl-shaped foliage. Its habit is very dense, and its branches and branchlets very crowded and irregular. Leaves about $\frac{1}{4}$ inch long, in opposite pairs, narrow and thin; slightly keeled below, nearly flat above; very glaucous below—two narrow white bands above between wide green margins and separated almost their entire length by a broad green midrib, tapering gradually to a long point which is frequently incurved. The branchlet sprays are about 3 inches long by 2 inches across, and are pointing forward at an angle of about 45 degrees.

This distinct form, much grown in gardens, grows fairly strong, and forms a good-sized bush; it is apt to get bare and ragged, and must be occasionally clipped or cut into shape.

Vars. *squarrosa sulphurea*, *argentea*, and *albo spica* differ only in the colour of their young foliage, which is light yellow, silvery, or white-tipped.

C. pisifera, var. squarrosa dumosa, Beiss. (ii. 568).

A more compact and much slower-growing form of extremely dense growth, sometimes broadly pyramidal, but more often globular or upright with a flattish top. I have only a small plant of this form which so far has made a small upright bush about 10 inches high.

C. pisifera, var. squarrosa intermedia.

Syn.: var. *squarrosa pygmæa*, Hort.

A most curious form of unknown origin, bearing two types of foliage—juvenile and intermediate. Sometimes the plant remains a very low round or flat-topped bush, in which case its foliage is nearly exclusively juvenile. At other times it sends up a central leading shoot, in which case it becomes cupola-shaped, the lower portion bearing juvenile foliage and the spire bearing intermediate foliage very similar to that of var. *squarrosa* (type).

The juvenile foliage is densely crowded in whorls of threes, mostly pointing out at a fairly wide angle, but sometimes pointing up with tips inclined to incurve. Length $\frac{3}{16}$ to $\frac{1}{4}$ inch, pale grass-green; thin but not narrow, tapering abruptly to a narrow point.

The intermediate foliage is smaller—about $\frac{1}{8}$ inch—equally densely crowded, but borne in opposite pairs, not in threes, all pointing forward at a narrow angle to the branchlet, and tips of leaves inclined to incurve.

I have seen no very old plants of this form, nor can I trace any; but since an average spray is only about $\frac{1}{2}$ inch in length, it is evidently extremely slow-growing.

C. pisifera (?), var. squarrosa minima.

Leaves in whorls of threes or in twos, length of free part $\frac{1}{10}$ to $\frac{4}{10}$ inch, recurving at right angles to branchlet, gradually tapering to a point; leaves not very thin; glaucous green. Upper side two slightly sunk white bands, separated from base to apex by broad green midrib; margins wide and dark green. Under side two

broad white lines separated by narrow keel. Leaves close set on branchlets and whole appearance very glaucous. Branchlets ascending and very crowded; annual growth of sprays about $\frac{1}{4}$ to $\frac{3}{8}$ inch.

I received this form from the Arnold Arboretum as the dwarfest variety of *C. pisifera squarrosa*, but its origin was unknown. If the descriptions of the two last varieties be compared, it will be seen that they are similar in some respects, but I do not understand why its leaves should mostly recurve, as in all other juvenile forms of *C. pisifera* they are inclined to incurve in twos; these juvenile forms are so similar to one another that in the absence of proof of origin one has to accentuate small points of divergence or of similarity. For instance, all juvenile forms of *Thuya occidentalis* have occasional leaves incurving and a general tendency to incurve; those of *T. orientalis* practically *never* incurve, and so on. In the present instance, as there is little in the appearance of the plant that would lead one to assume that it was a juvenile form of *C. pisifera*, I should like to know its origin, and whether it was actually grown from *C. pisifera* seed or was assumed to have been so.

C. pisifera, var. plumosa, Beiss. (ii. 567).

Syn.: *Retinospora plumosa*, Veitch.

Also introduced by J. G. Veitch from Japan in 1861. Another juvenile form, an intermediate state between var. *squarrosa* and the type, and forming a smaller, more compact, and more broadly pyramidal bush. Leaves only about half the size of the former, arranged in opposite pairs, and much closer together, tapering more rapidly to a longer and sharper point, concave and green on the outside and convex and very white inside, with either no dividing midrib or midrib very prominent and well shaped. Leaves somewhat appressed to branchlet and pointing forward.

I do not know whether this form originated from seed,

or from a sport. I am inclined to think it originated from a sport, for upon the upper branches of an old plant of var. *squarrosa* in this locality I have seen branchlets bearing the foliage of var. *plumosa*. Some of these I have removed and am endeavouring to propagate them.

It has coloured forms known as vars. *albo spica*, *argentea*, *aurea*, and *aurescens*, which differ only in the colour of their foliage, and most of them are common in gardens; but *C. pisifera plumosa*, var. *flavescens*, Beiss. (ii. 568), which is described as a broad, crowded, branched, but very regular and compact conical bush, yellow-white in colour, I have never seen.

C. pisifera plumosa, var. **aurea compacta**, Beiss. (ii. 570).

Syn.: *Retinospora plumosa aurea nana*, Hort.

Beissner regards these forms as identical, and states that they form a broad yellow conical bush; if so, the form now sent out as *C. pisifera plumosa*, var. *nana aurea*, is a different thing, as, far from being conical, it makes a very low, compact, rather flat cushion—rather bun-shaped. It is extremely slow in growth; leaves set farther apart— $\frac{1}{16}$ to $\frac{1}{8}$ inch—and not so appressed; round, pointing out at almost a right angle to branchlets which grow only 1 to $1\frac{1}{2}$ inches annually. My largest plant is only 5 inches high by about 14 inches across. I have seen this form elsewhere, and it has invariably been cushion-shaped.

C. pisifera plumosa, var. **cristata**, K. Onuma (Beiss., ii. 570).

A form found by Herr Unger in Yokohama; of luxuriant growth, with crimped or curly side branches and cockscomb-like branchlet tips.

C. pisifera, var. **nana**, Beiss. (i. 91).

Is one of the smallest of conifers, making a very low, flat-topped bush of dark blue-green foliage. Branchlets fan-shaped, with decurving tips. These fan-shaped

secondary branchlets are about $1\frac{1}{2}$ inches long and 1 inch across the spray. An old specimen in my possession has made a low cushion 10 by 12 inches through.

C. pisifera, var. nana aureo-variegata.

Syn.: *Retinispora pisifera nana aureo variegata*, Van Giert.

Is similar and possibly slower in growth; some of its foliage is tipped with gold. I have an old specimen of this form, certainly twenty years of age, which has made a dense flat-topped cushion about 21 inches in height by 2 feet through, but at Curragh Grange there is a smaller specimen about 14 by 18 inches of perfect shape—a dense rounded cushion.

Beissner (ii. 573) records *C. pisifera aurea nana* (a form that I have never seen) with all its foliage yellow.

Here I must mention a juvenile form grown at Sir Edmund Loder's, Leonardslee, Horsham, as—

C. pisifera, var. ericoides, Regel ("Russ. Dendr.," ed. 2, 27, 1883).

This was obtained from Dickson's Nursery at Chester, but its origin cannot be traced, and it is nearer in appearance to a juvenile state of *Thuya plicata*, Don, than to *C. pisifera*. These juvenile forms, however, are not easy to determine, and my knowledge of this plant being limited to the examination of a small branch of it, it remains for the present unverified.

Its branches are all ascending, red-brown, and stout. Branchlets, green to red-brown; very crowded and ascending at so narrow an angle as to almost touch each other. It is not unlike *Thuya occidentalis*, var. *ericoides*, at first sight, but the number of young branchlets on a spray of the latter is about two to three, while on the former they are three to six.

Leaves borne usually in threes, sometimes on weak shoots in twos; pale, bright green, turning slightly brown in winter. On side shoots, just over 1 mm. wide at base

and tapering rather abruptly. On stronger shoots nearly 2 mm. wide at base, and then rapidly tapering, being shaped like a spear-head. (Those of *Thuya occidentalis* are barely 1 mm. wide and taper gradually.) Leaves very close together on branchlets, and irregular in direction; mostly recurved, but some point outwards and a few forwards. Leaves thin and flat, ending in a sharp point; light green above, glaucous beneath. On both upper and lower sides is a narrow raised midrib, that of the lower separating two narrow slightly sunk stomatic bands.

This is a very dense upright form, making at Leonardslee a compact pyramidal bush 3 by 2 feet. It is ten years planted.

C. sphæroidea, Spach.

Syn.: *Cupressus thyoides*, Linnæus.

The white cedar inhabits Eastern North America, and is found in swampy ground from Southern Canada to North Carolina. It has been cultivated in Europe since 1736, but has not produced many dwarf forms. Its leaves when crushed emit a strong savin-like odour.

C. sphæroidea, var. ericoides, Beiss. and Hochst. (ii. 531).

Syn.: *Chamæcy. ericoides*, Carr. ("Conif.," i. 140, 1855).

Retinospora ericoides, Zucc. and Gord. (ii. 363, 1862), (not Hort).

Cup. thyoides ericoides, Kent (Veitch, "Conif.," 1881-1900).

Cup. ericoides, Hort.

Junip. ericoides, Hort.

Widringtonia ericoides, Knight.

Retinospora ericoides stricta, Hort aliq.

Thuya occidentalis ericoides, Bean ("Trees and Shrubs," ii. 587, 1916).

Leaves in threes, but sometimes in opposite pairs, spread out or bent downwards; linear, flat, $\frac{1}{4}$ inch; frequently slightly convex; under side two stomatic bands,

tapering gradually to point; decurrent at base and mucronate. Unlike most juvenile forms, its leaves emit the savin-like odour of its type when crushed.

A regular very close-growing and compact narrowly pyramidal bush, eventually about 4 to 6 feet in height. Branches slender, but stiff and ascending at a narrow angle, with numerous horizontal branchlets which are very slender and compact. Colour grey-green in summer, deep purplish or violet-brown in winter. One of the fixed juvenile forms which occur in nearly all the *Thuyas* and *Cupressus*, and which vary only slightly from one another. This form is very slow in growth, and I have only young plants of it.

There is a glaucous grey-green sport of this, var. *ericoides glauca*, found in Dresden, and recorded in "Mitt. d. d. d. Ges." (1900), p. 64; Beiss. (ii. 532).

C. sphæroidea, var. *Andelyensis*, Carr. (2nd ed., 123, 1867).

Syn.: *C. leptoclada*, Hochst. (Nadl., 257, 1865).

Retinospora leptoclada, Gord. (not Zucc.).

Leaves of two kinds, adult predominating. Juvenile in whorls of threes. Spreading, curved, linear, and flat; arranged radially, about $\frac{1}{4}$ inch long. Adult foliage scale-like and imbricated in opposite pairs; those on margin keeled, overlapping and sometimes incurved. Those along the centre are flat with a well-defined resin pit in the middle. Branches ascending; branchlets very crowded, especially towards their tops—making a fan-shaped head of flat glaucous foliage terminating in conspicuous red bands.

A dense compact pyramid eventually 3 to 6 feet in height, furnished with branches right down to the ground.

Carrière (ii. 124) states that this form of *C. sphæroidea* originated as a seedling in the nursery of Couchois in Andeleys (Eure), France, in 1850. It was raised from seed of *C. sphæroidea*, and the raiser kept it a long time unnamed, until he showed it at the Paris Exhibition of

1855. Later he sold it to Messrs. Henderson and Sons, who, in error, called it *Retinospora leptoclada*. The leaves of this plant when crushed give off the savin-like odour of *C. sphæroides*. The plant is usually found in gardens under the name of *Retinispora leptoclada*.

C. sphæroidea, var. **Hoveyii**, Beiss. (ii. 534).

A distinct monstrous form, with crowded cockscomb-like branch tips.

C. sphæroidea, var. **nana**, Endl. ("Syn. Conif.," 62) ex Beiss. (ii. 534).

Syn.: *Cup. thyioides nana*, Loud.

A densely branched blue-green dwarf form, forming a small round, almost spherical bush.

C. sphæroidea, var. **pygmæa**, Carr. (ii. 124).

Syn.: *C. pumila*, Hort.

The smallest dwarf form; smaller, flatter, cushion-shaped bush with numerous short blue-green branches, and branchlets spreading densely over the ground. Leaves scale-like; imbricated, blue-green, and crowded.

Carrière states that this remarkable form was raised by M. Sénécلاuze. The mother plant, over ten years of age, was only 15 cm. in height—a tiny compressed bushling.

CRYPTOMERIA, Don.

Cryptomeria Japonica, Don, was introduced into Europe in 1844. In small gardens it is represented by its juvenile form, var. *elegans*, whose bright red-brown winter foliage adds a pleasing touch of colour. Its dwarf forms are mostly of Japanese origin, and some of them are most distinct; the absolute regularity of outline of var. *globosa nana* is as pleasing as the mop-head of twisted and contorted cord-like branchlets of var. *spiraliter falcata* is remarkable. All the cryptomerias like light soil and moisture.

C. Japonica, var. compacta, Beiss. (ii. 482).

An ornamental densely branched dwarf form of compact conical growth, reaching about 3 feet in height; branchlets crowded and blue-green, the needles being short and stout. I have not seen it.

C. Japonica, var. nana, Knight ("Syn. Conif.," 22).

Syn.: *C. nana*, Lindl. and Gord.

C. Japonica pygmaea, H. B. ex Knight.

Fi-sugi or *Birodo-sugi* (Jap.).

A slow-growing, very irregular dwarf form, making a bush 2 to 3 feet high and wider than high. Branches, branchlets, and leaves short, crowded and stiff, and here and there branchlets surmounted with congested branchlets like cockscombs. Branchlets twisted or erect. Leaves appressed with points free and recurved, free points $\frac{1}{8}$ to $\frac{1}{4}$ inch. Annual growth of branchlets is irregular, from $\frac{3}{10}$ inch to 6 inches. My best specimen is 2 feet 6 inches by 3 feet through.

C. Japonica, var. nana albo-spicata.

This does not seem to be a variegated form of var. *nana*—at least, I have never seen it bearing the congested branch heads of that variety. On the contrary, it forms as a rule a small, not very crowded, but compact conical bush, branches and branchlets ascending, some of the latter tipped with white.

C. Japonica, var. Viminalis, Hort.

Syn.: var. *lycopodiformis*, Beiss. (ii. 483);

var. *Selaginoides*, Hort.

? var. *Virgata*, Mayr.

A very curious form, sending out long slender snake-like branches with few, or no, side branchlets. The branches grow on yearly from the terminal bud and retain their foliage. The occasional side branches are usually also single and short, but at times are crowded with a whorl of five or six smaller branchlets. Branches very irregular

in length. On a small plant, 18 inches high, I measured branches without any side branchlets varying in length from $\frac{1}{2}$ inch to 19 inches.

C. Japonica, var. *cristata*, Beiss. ("Mitt. d. d. d. Ges.," 1901, 77).

Syn.: var. *monstrosa*, Hort;
var. *Sekka-Sugi* (Jap.).

A broadly conical bush, slow-growing, but ultimately attaining a good height. Branches short, stiff, and ascending. Branchlets very short and stiff and crowded. On adult plants most of the branchlets are fasciated, terminating in large cockscomb-like growths densely covered with short stiff leaves, the "combs" being about the same size and having the same appearance as those of the cockscomb *Sedum*—*S. reflexum cristatum*. Here and there a few normal branchlets appear, but upon vigorous plants the abnormal growths predominate. There is a very fine specimen of this form at Kilmacurragh, Rathdrum, Co. Wicklow. Age unknown, but evidently a very old specimen; it is now a beehive-shaped bush about 9 feet high by 12 feet through.

C. Japonica, var. *spiralis*, Sieb. and Zucc. ("Fl. Jap.," ii. 52, 1870).

Syn.: var. *spiraliter falcata*, Sieb. "Fl. Jap.," t. 125.
var. *Kusari-Sugi* (Jap.).

Of this there appear to be two forms, one with very thick pendulous or stiff branchlets, not very long, and rather stouter and wider in the middle than at the ends. The other with longer, slenderer branchlets, very pendulous and almost whip-like. In both forms the leaves are usually twisted tightly around the branchlets, but at times they grow quite straight.

I have carefully observed these forms for some time, and I note that they, in common with other dwarf forms, particularly some forms of *Picea excelsa* (var. *nana*, for example), have seasons of comparative rest and seasons

of strong growth. These spiral forms of *cryptomeria* in their seasons of strong growth send out an unusually large number of branches and branchlets, the majority of which have normal foliage, but this normal foliage in "resting" seasons at once curls tightly again round the branchlet. In grafted plants there is a general tendency to revert to the normal permanently, and at Mount Usher, Co. Wicklow, I saw a tree of, I think, the first form which has thrown up a leader, and is normal and arborescent except at the base, which retains its bushy habit and pendulous spiral foliage.

There is a normal tree at Stradbally Park, Queen's Co. (about 70 feet in height), on a low-growing branch of which a perfectly globose "witches'-broom" of very dark green thick foliage has appeared. It is about 2 feet through, and from the appearance of some of its branchlets it is possible that they also have at times their foliage twisted round them in this manner.

C. Japonica, var. globosa nana.

Branches ascending. Branchlets pendulous or arching; annual growth 1 to $1\frac{1}{2}$ inches. Leaves from $\frac{1}{4}$ to $\frac{1}{2}$ inch; light yellow-green, radial, and somewhat appressed to the branchlet, incurved and stout.

This makes a compact, regular, rather open-growing flat or round-headed bush, shaped like a wide-mouthed funnel. My best specimen is about 2 feet 6 inches by 3 feet 6 inches.

C. Japonica, var. elegans nana ("Mitt. d. d. d. Ges.," 1899, 141).

A dwarf form of the fixed juvenile foliaged variety, making a compact, fine-branched oval bush with pendulous branchlets. Beissner (ii. 481) records two good specimens in the Hofgarten at Wilhelmshöhe. My best specimen is about 3 feet high.

CUPRESSUS.

Cupressus macrocarpa, Hartweg.

The Monterey Cypress from California, although nearly 100 years in cultivation, has so far only produced two slow-growing forms, both of very recent introduction, and neither of which I have seen.

C. macrocarpa, var. **compacta**.

Raised by Hillier of Winchester, and not yet distributed, and described by him in 1920 catalogue as a "handsome small globular form."

C. macrocarpa, var. **Crippsii**, Bean ("Trees and Shrubs," i. 447).

Bean describes as a juvenile state with stiff branches, raised at Tunbridge Wells. Both these grow too large in time.

C. sempervirens, Linnæus.

Of the Roman Cypress, Carrière records two dwarf forms, neither of which I can trace in cultivation.

C. sempervirens, var. **fastigiata monstrosa**, Carr. ("Conif.," ii. 148, 1867).

Syn.: *C. sempervirens monstrosa*, Gord. ("Pinetum," 69).

A dwarf variety with branchlets and sprays, stout, nearly four-sided, fasciated or monstrous.

C. sempervirens, var. **fastigiata Fortuselli**, Carr. ("Conif.," ii. 149, 1867).

Syn.: *C. Fortuselli*, Hort.

A very compact dwarf plant. Branches and branchlets very compact, small, almost four-sided, compressed, and glaucous.

He also records—

C. torulosa, Don, var. *nana*, Gord. ("Pinetum," 71).

Syn.: var. *minima*, Hort.

A very dwarf compact form, without detailed description. I can no longer trace this plant in cultivation. It was listed in the catalogue of the old Lawson Nursery at Edinburgh in 1875, and possibly later.

JUNIPERUS.

Among the junipers will be found some of the most indispensable of dwarf conifers. Taking them on the whole, they are possibly the most useful. They are easy to grow and easy to propagate; nearly all are indestructibly hardy, and they supply us with every variety of shape we can require: prostrate mats; small cushions; upright, fastigiate, and conical forms, in various colours of green, blue, and gold; and were I restricted to one dwarf conifer alone, my choice would undoubtedly fall upon *J. communis*, var. *compressa*.

The junipers are not easy to separate, and in some cases, in the absence of fruit, identification is almost impossible. There are four species that supply us with the most of our dwarf forms—namely, *J. communis*, *J. Virginiana*, *J. Sabina*, and *J. Chinensis*. The first invariably bears nothing but juvenile awl-shaped foliage; the other three bear both in greater or lesser proportions. The other three may be roughly distinguished from one another as follows: The juvenile foliage of *J. Virginiana* and *J. Sabina* is very similar; leaves in opposite pairs, the inner side of each leaf being covered (except the margins) with a glaucous white band. Their adult scale-like foliage is slightly different—that of the former being narrow and finely pointed, that of the latter being humped with a round blunt apex; the latter also has a strong disagreeable smell when crushed.

The juvenile foliage of *J. Chinensis* is usually borne in

whorls of threes, and the white band on the inside of leaves is usually divided by a green midrib. Its adult scale-like foliage is nearer to that of *J. Sabina*, but its points are rather blunt than rounded, and the leaves are closely appressed, not humped.

J. Chinensis, Linnæus.

Is a species with complications: in addition to having several other species very nearly related to it, it has unisexual, masculine and feminine forms, also forms which bear both juvenile and adult foliage, and others in which either juvenile or adult predominate to the practical exclusion of the other. It is, therefore, not surprising that there has been much confusion in naming and sorting some of its varieties.

J. Chinensis, var. **pendula** and var. **pendula aurea**, Beiss.
(ii. 605), and var. **pendula monstrosa**.

Are pendulous forms recorded by Beissner which I have not found in cultivation.

J. Chinensis aurea, Young (*Gard. Chron.* [1872], 8 and 1193).

Syn.: *J. Chinensis Youngi*.

This in time grows too large, but being of slow growth it should be retained as long as possible on account of its wonderful colour, the whole of the young growth being a brilliant golden-yellow. It makes a dense shrub and should be grown in full sun. This is a male form and was raised at Young's Nursery, Milford, Surrey. It bears both juvenile and adult foliage.

J. Chinensis, var. **Pfitzeriana**, Späth ("In der Gartenwelt," 1901, 403).

According to Beissner (ii. 605) the present plant in Späth's Nursery has made a pyramid 4 metres high by as much through. It is a rather broad, slow-growing pyramid; branches ascending, branchlets spreading, foliage fine. Light grey-green.

J. Chinensis, var. Sheppardi.

Syn.: *J. Sheppardi*, Kent in Veitch ("Manual of Conifers," p. 290).

J. sphaerica glauca, Beiss. and Gord. ("Pinetum," p. 122, 1862).

This is stated by Beissner to have been found by Fortune in China, and there is some confusion about it. One finds it usually grown as *J. Sheppardi* or *J. sphaerica*. In reality it appears to be nothing more than a fixed juvenile form of *J. Chinensis*, bearing invariably awl-shaped foliage of a very pleasing glaucous blue-green, and making an irregular and rather floppy bush owing to the suppleness of its branches and their rather top-heavy load of branchlets.

J. Chinensis, var. globosa.

Syn.: *J. Virginiana globosa*, Hort, in error.

J. virginalis globosa, Yokohama Nursery Co. Cat., 1911-22, p. 33 (and probably earlier).

This plant was always a puzzle to me. I could not understand how *J. Virginiana*—a species inhabiting the Eastern States of U.S.A. and Canada—came to be a common and much cultivated plant so far west as Japan, and why Japanese gardeners should take the trouble to raise garden forms of this when they possessed so many junipers of their own. However, importation succeeded importation from Japan, and the plant was distributed as a form of *J. Virginiana*. But recently a careful examination of the plant leads me to believe that it is not a form of *J. Virginiana* at all, but a form of *J. Chinensis*; if this is so, its widespread cultivation in Japan is at once accounted for. My plants have not yet borne fruit, but subject to such confirmation, when, if ever, they do, they have undoubtedly more points of resemblance to *J. Chinensis* than to *J. Virginiana*. I have three forms, all making low, compact, round-topped bushes of extremely slow growth and regular appearance. One is dark green

—var. *globosa* ; another has golden foliage—*forma aurea* ; and the third grey-green foliage—*forma Cinerea*.

Forms 1 and 2 are unisexual, and have mixed juvenile and adult foliage, but only a little of the former and at the base of the bush ; none on top.

Form 3 is a male plant, and bears mixed foliage (adult predominating) all over it. In all these cases the sharp-pointed juvenile awl-shaped leaves are borne in whorls of threes, the glaucous stomatic bands on the upper sides being separated the whole way by a raised midrib, and the adult scale-like leaves have very blunt tips. In the case of *J. Virginiana* the juvenile leaves are in twos, not threes: the stomatic band covers the whole upper surface except the margins, and the adult leaves are humped with rounded tips.

J. Chinensis, var. **Sargentii**, Henry (Elwes and Henry, vol. vi.).

A seashore plant recently found by Sargent in Northern Japan, forming prostrate mats 8 to 10 feet across. Branchlets tetragonal; covered with minute scale-like appressed leaves furrowed on the back. No acicular leaves on adult plants. Berries bluish with slight glaucous bloom. Seeds, three. The above is Henry's description. I have only seedling plants sent to me by Professor Sargent, and at present they have only juvenile foliage—which it bears usually in threes—small, about $\frac{3}{16}$ inch, pointing forward at angle of about 30 degrees and slightly incurved. Outside green, convex, slightly keeled. Inside concave, with sunken very white band between two broad green margins, and sometimes divided by a narrow green midrib for one-half to two-thirds of its length. Leaves end in a round or abrupt point, furnished with a short sharp cartilaginous point.

J. Chinensis, var. **albo-variegata**.

Syn.: *J. Fortuni*, Hort (not Van Houtte).

This is the well-known dwarf bushy plant with blue green juvenile and adult foliage with a certain number of the young shoots quite white; the colour and variation

is very irregular. It grows fairly large in time, but is slow-growing and most useful for a rough corner. It is a pity that it was not named originally var. *albo* "*spicata*" rather than *variegata*, as the latter name is also applied to another form of *J. Chinensis* (to which it is more suited). Nurserymen occasionally list this plant as "*J. Fortuni*" (a name belonging to *J. sphærica*), the only conceivable reason for their doing so being the fact that this form happens to be one of the plants introduced by Fortune from Japan.

We now come to one of our difficulties.

J. Chinensis, var. **Japonica**, Lavallée. ("Art. Segrez," 290, 1877).

Syn.: *J. Chinensis procumbens*, Endl. } Beiss. (ii. 607)
J. procumbens, Sieb. } in error.
(In part) *J. Japonica*, Carr. ("Conif.," ii. 33, 1855).

There is no such species as *J. Japonica*, but this name has been loosely and generally applied to several varieties of *J. Chinensis*, which, however, are fairly distinct from one another. What one may term the typical "*J. Japonica*" of gardens is a bushy plant with rather low-spreading fan-shaped branches slightly raised at the tips. In very small plants the juvenile foliage predominates; in older plants the adult predominates. This form is now not common in gardens, being usually represented by one or other of its two coloured forms—var. *albo variegata* and var. *aureo variegata*; as well as being known as *J. Japonica*, these two coloured forms are also occasionally found as *J. Sinensis*, vars. *aureo* and *albo variegata*, and as *J. Virginiana*, vars. *aureo* and *albo variegata*.

These two coloured forms resemble the green form exactly in its decumbent habit, the only difference in their case being that the adult foliage predominates even in small plants. Otherwise they are like the green form in every respect, and their variegation is quite regular all over the plant; this var. *albo variegata* therefore must not,

and cannot, be confused with *J. Chinensis albo variegata*, which differs in habit, foliage, and method of variegation.

In addition to this green decumbent form and its two coloured varieties, we are further confused by finding in gardens an entirely different form, or rather a different form and a variety of it, also passing under the name of "*J. Japonica*," in this case being called *J. Japonica aurea*; of this there are actually two varieties, one quite green and the other with its newer foliage a deep bronze-gold. The green variety is rare, and is invariably found under the name of *aurea*, its owner never being able to account for the fact that it is not golden in colour. These two varieties throw up long plumose arching branches of adult foliage. Juvenile foliage may occur at the base of the plant, but I have never noticed it, and in any case the appearance of this plant is of one having adult foliage only, and it is not the least like the other forms before mentioned either in habit or foliage.

There are also in cultivation a form making a round umbrella-shaped head of drooping branchlets, bearing both juvenile and adult foliage, the former predominating—this is usually named *J. Sinensis procumbens* or *J. Japonica procumbens*; and an upright narrow pyramidal form, for which see *J. Chinensis pyramidalis*.

Our final difficulty in this group of varieties is due to Beissner, in error, making all these forms identical with *J. procumbens*, Sieb. (syn.: *J. Chinensis procumbens*, Endl.).

It is evident, from his description of the first form (*J. Japonica*, hort.) as a bushy shrub with adult foliage on the upper branches, that he is not describing the true *J. procumbens*, Sieb., which is a prostrate plant near to *J. squamata*, having invariably only juvenile (acicular) foliage; he is probably describing the *J. Sinensis procumbens* referred to above. To the true *J. procumbens*, Sieb., none of the forms I have mentioned bear the least resemblance, and that name being disposed of, and there being no reason why these forms should be distinguished

from other *Chinensis* forms by the name *Japonica*, nor why, being distinct from one another, they should be given a joint name at all, I have divided them and given them each a name that better describes their habit.

Therefore the first green form I call—

J. *Chinensis*, var. *decumbens*.

Syn.: var. *Japonica*, Lavallée.

J. Japonica, Carr.

J. Chinensis procumbens, Endl. } Beiss. (ii. 607)

J. procumbens, Sieb. } in error.

A low-growing shrub with decumbent fan-shaped branches, their tips sometimes pendulous and bearing both juvenile and adult foliage.

Its two varieties will be:

J. *Chinensis*, vars. *decumbens aureo-* and *albo-variegata*.

Syn.: *J. Japonica aureo* and *albo variegata*, Hort.

J. Sinensis aureo and *albo variegata*, Hort.

J. Virginiana aureo and *albo variegata*, Hort.
(in error).

Similar in habit, but with adult foliage predominating and foliage regularly variegated.

The plumose form and its variety I call—

J. *Chinensis*, var. *plumosa*.

Syn.: *J. Chinensis procumbens*, Endl.; *aurea* (Beiss., ii. 608, in error).

J. Japonica aurea, Hort.

A plant sending up and out long arching stems with short feathery pendulous branchlets forming plumose sprays of adult foliage like pampas grass.

And its variety will be:

J. *Chinensis*, var. *plumosa aurea*.

Syn.: *J. Japonica aurea*.

J. Chinensis procumbens, Endl.; *aurea* (Beiss., ii. 608, in error).

The foliage similar in every respect except in colour, in this case being suffused with bronzy gold.

I have never met with an old specimen of the so-called *J. Sinensis procumbens*, hort.; if it retains the habit of the young specimens it should be called *J. Chinensis*, var. *umbraculifera*.

***J. Chinensis*, var. *pyramidalis*, Beiss.**

Syn.: *J. Japonica pyramidalis*, Carr. ("Conif.," ii. 32).

J. pyramidalis glauca, Hort.

J. Japonica, Hort aliq.

A vigorous shrub forming a narrow, compact pyramid. Branches erect. Branchlets numerous. Leaves nearly always acicular, in whorls of threes; very stiff, thick, keeled below, concave and very glaucous green above; acuminate, 4 to 10 mm. long. Adult scale-like foliage very rarely borne.

Carrière states that adult foliage is acquired late and only when the plant is old. I have never seen adult foliage on any specimen of this form, which is distinguished by its neat upright habit and extremely glaucous foliage.

***J. Chinensis*, var. *nana*, Hochst. ("Conif.," 90, 1882).**

A form I received without description from the Arnold Arboretum. Extremely slow-growing. On the specimens I received the adult foliage largely predominated, and it would appear to be the erect form of var. *globosa*, its sprays being similar to that variety in size and general appearance.

***J. communis*.**—Under the name of *J. communis* most authorities nowadays group the many geographical forms of this species that one meets in cultivation under separate names, and the result is most confusing.

J. communis now includes:

- (1) *J. nana*, Willd.; *J. alpina*, Clus.;
- (2) *J. Canadensis*, Lodd.; *J. C. depressa*, Pursh;
- (3) *J. hemispherica*, Presl.;
- (4) *J. hispanica*, Booth; *J. "hibernica compressa"*;

and many others less well known. Inhabiting, as it does, practically the whole of the Northern Hemisphere, it is not surprising that it varies considerably in habit and in foliage, and one or two of these forms are worth mentioning:

Var. *nana* may be taken to represent a low bushy form with leaves usually larger and more concave than the type; deep yellow-green outside; very glaucous blue-white inside. There is a yellow form of this.

Vars. *Canadensis* and *depressa* seem very similar, but are semi-prostrate in habit.

Var. *prostrata*.—An absolutely prostrate form is occasionally met with. I have one collected in Connemara, Co. Galway, foliage much smaller than the type. It has made a prostrate mat flowing down over rockwork.

J. communis, var. *nana*, Loud. (vol. iv., 2486; 1838).

Syn.: var. *alpina*, Gord.

J. nana, Willd.

J. alpina, Clus.

J. communis, var. *Montana*, Ait.

A low prostrate shrub, rarely more than 1 foot high. Branchlets shorter than the type. Leaves also shorter and less spreading, $\frac{1}{6}$ to $\frac{1}{3}$ inch long by $\frac{1}{24}$ to $\frac{1}{12}$ inch wide, gradually tapering to spire-like apex; upper side very concave with continuous very glaucous white stomatic band; lower convex, bluntly keeled. Fruit glaucous blue, globose, $\frac{1}{5}$ inch in diameter. Number of seeds variable, one to three. It rarely bears fruit.

I cannot trace the origin of the plant usually sent out as *J. nana*, Willd., and recognised by most authorities as *J. communis*, var. *nana*, Loud.; but it is a very distinct low or semi-prostrate shrub easily recognisable by its grey or brown-green, short and very concave leaves and their exceptionally glaucous upper side.

Although most authorities now group all the prostrate or procumbent varieties of the common juniper under the

one name of var. *nana*, I personally think it was a mistake not to distinguish this particular form, which is usually described as the type of var. *nana*, from the many local and geographical forms, which vary little, except in habit, from the arborescent common juniper. In most localities where the arborescent type is found, shrubby or prostrate forms can usually be found at no great distance, either on adjacent hills or sometimes even among arborescent forms: I have often found them in Western Ireland. But such forms are really merely prostrate or shrubby "states" of the type, and are liable to revert to the type in lowland cultivation.

Unfortunately one result of calling all these prostrate forms var. *nana* has been to confuse these chance "states" with the distinct typical form. Professor Henry (Elwes and Henry, vol. vi., p. 1401) mentions that Kirchner and Schroter are of opinion that var. *nana* is not, as some believe, a species, but a mere climatic form, adducing as proof that sowings of seed of var. *nana* at Berlin and Zurich gave seedlings of the arborescent type; and plants of the type moved from Fontainebleau to Mont Blanc assumed the habit of var. *nana* in three years.

This statement would be more convincing if one was certain that (1) the sowings were of seed of var. *nana* type, and (2) that the Mont Blanc plants assumed the distinct foliage, etc., of var. *nana* type. But as regards the first, var. *nana* is a very shy seeder in cultivation, whereas the prostrate "states" of the arborescent type seed quite freely, and I think it highly probable that the seed-sowing experiments were not of var. *nana* type, but of some prostrate form identical with the arborescent type except in habit; and that, as regards the second statement, the probabilities are that the arborescent type simply assumed the prostrate state on Mont Blanc, and did not, in fact, become identical with var. *nana* type.

There are old specimens of var. *nana* type in the British Isles. I know of three of over fifty years of age.

One in Glasnevin Botanic Gardens, Dublin, is probably nearer seventy than fifty, and none of these old specimens has ever shown the least inclination to revert to normal in cultivation. Nor can I trace any specimen of this form that ever did so revert, and if it is to retain the name of var. *nana*, one must exclude from that name all those prostrate and shrubby forms or states which do, or are likely to, revert in cultivation. This constant semi-prostrate form, with its distinctions in foliage, and size and number of seeds, has as much claim to be given a distinctive name, as *J. procumbens*, Sieb., has to be separated from *J. squamata*.

J. communis, var. **compressa**, Carr. ("Conif.," 22).

Syn.: var. *hibernica compressa*, Carr. ("Man. des Plantes.").

J. compressa, Rinz.

J. hispanica, Presl. ex Gordon (not Mill.).

Annual growth $\frac{1}{4}$ to 1 inch. Young branchlets white-green; old branchlets red-brown. Three-sided; ascending at a very acute angle. Leaves acicular in whorls of threes; thin, very fine and small, from $\frac{1}{8}$ to $\frac{1}{4}$ inch; under side convex, bright green, slightly keeled; upper side very glaucous, sunken stomatic band usually divided from base to near apex by a narrow green line. Fruit not seen. Branches very short and densely crowded. The whole forming a tiny fastigiate plant rarely attaining 3 feet in height.

An indispensable very distinct form, of extremely slow growth, usually known in gardens as *J. "hibernica" compressa*. I do not know how the legend ascribing the arborescent fastigiate common juniper to Ireland originated; possibly the existence of the Florence Court fastigiate Yew may account for it, but I have neither seen it growing wild in Ireland nor read any authentic record of it being found in this country. Elwes and Henry (vi. 1402) identify the arborescent "*var. hibernica*" with



PYGMY JUNIPERS (*J. COMMUNIS*, VAR. *COMPRESSA*), AT KNAPTON,
QUEEN'S CO.

var. *Suecica* (Aiton), and further state that var. *compressa* has been identified by Koch ("Dendrol.," 11, 11, 115) with *J. hispanica*, Booth, and as this dwarf form is undoubtedly less hardy than its arborescent type, this identification is in all probability correct. In my garden var. *compressa* occasionally gets "browned" on the top by severe frost, and plants of it in exposed situations also get browned on their sides exposed to icy winds in spring. My largest specimen is under 20 inches in height, and the two biggest I know are at Mount Usher in Wicklow and in the garden of Mr. Robert Elliott at Hawick, Scotland, the former about 33½ inches and the latter just 32 inches in height.

J. communis, var. *echinæformis*, Beiss. (i. 137, 1891).

Syn.: *J. oxycedrus echinæformis*, Knight ("Syn. Conif.," ii. 1850); Elwes and Henry ("Trees of Great Britain," vol. vi.).

A tiny dark green globose bush with crowded, compact, stout and short branches densely covered with tiny leaves. An extremely slow-growing form, rarely exceeding 1 to 2 feet in height, with foliage and branchlets very similar to those of var. *compressa*. According to Gordon ("Pinetum," 135) its fruit is globular and bright shiny red. It has been known in gardens for many years, having been first sent out by Rinz of Frankfort. It has been confused with *J. hemispherica*, Presl. (*q.v.*), and it is debatable whether it is in reality a variety of *J. communis* or of the South European *J. oxycedrus*.

It is far more tender than var. *compressa*, and for that reason alone would seem to be a seedling rather of the Southern *J. oxycedrus* than of the very hardy *J. communis*. It is now very rare, and there is a small plant of this form at Kew, grown there, I believe, under the name of var. *hemispherica*.

J. communis, var. **Jackii**, Rehder ("Mitt. d. d. d. Ges.," 1907).

From California and Mount Rainer; seems from its description to be barely distinguishable from var. *nana*. Wherever *J. communis* and var. *nana* are found, intermediate forms between the two may usually be detected.

J. communis, var. **aurea**, and **J. communis**, var. **nana aurea**.

There are golden variegated forms of the type and also of var. *nana*. That of the type is slow enough in growth to be included among one's dwarf trees. That of var. *nana* differs only in colour.

J. hemispherica, Presl. ("Delic. prag.," p. 142).

Syn.: *J. nana hemispherica*, Carr. ("Conif.," p. 16, 1867).

J. communis hemispherica, Parl. ("Dec. Prod.," 2, 479, 1868).

A dwarf juniper of uncertain status. Presl describes it as follows: "A low shrub, about 30 cm. in height, tufted, hemispherical. Branches cylindrical and greyish. Leaves like the common juniper, but three times shorter and slightly wider; always whitish below, having a raised keel. Varying little in fruit, which is borne on the axils and is blue in colour. The berries are larger than the type, smell stronger of resin. A neighbour of *J. communis*, it differs in its habit, its hemispherical shape, chiefly by its small tufted habit, its cylindrical branches and branchlets, its stouter and wider leaves, also by its larger berries (equal or a little shorter than the leaves). It must not be confounded with *J. nana*."

Most modern authorities class this juniper as a variety of *J. communis*, as *J. nana* (Willd.) is now classed, but *J. nana* (type) is accepted to be merely an alpine form of *J. communis*, and is stated to be the arborescent type stunted into a bush form by growing in alpine conditions and occurring in such positions in every locality where the arborescent type is found in lowland conditions.

If this be the case, one cannot then satisfactorily account for *J. hemispherica*, which, according to Elwes and Henry ("Trees of Great Britain," vol. vii., 1402), is found on Mount Etna, Calabria, Greece, and Algiers. Beissner (ii. 619) gives its habitat as "Mountains of Sicily, Greece, and North Africa, and Presly adds to these certain mountains in the Apennines near the Abruzzi, where it is found in the subalpine regions. But var. *nana* is also found (Beiss., ii. 618) in the subalpine regions of the Apennines, Thrace, and Macedonia, and in that case *J. hemispherica* can hardly be termed, as Adamovic terms it, a mere geographical form of *J. communis nana*, if, as would appear, they both grow in the same localities; and since *J. hemispherica* differs from *J. communis* at least as much as *J. oxycedrus*, Linn. (which is given specific rank), differs from *J. cedrus*, Webb, I have preferred to follow Presly, Schow, and some of the earlier authorities in regarding this juniper as a species. It is very rare in cultivation, *J. communis echinæformis* usually doing duty for it.

J. conferta, Parl. ("Nov. Conif.," 1863).

Syn.: *J. litoralis*, Maxim. ("Mél. Biol.," vi. 375, 1868).

Branchlets greeny-white; second year, red-brown. General appearance not unlike that of *J. cedrus*, only more compact and more spreading.

Leaves all acicular, about $\frac{9}{16}$ by $\frac{1}{26}$ inch; upper side very concave; broad white stomatic band, partly hidden by broad incurving green margins. Under side green, very convex; groove doubtful. Leaves are straight, rigid, and end in a long, very sharp point, and are attached to stem of branchlet by raised, ridged pulvini, the ridge extending from base of leaf to below and between the bases of the two leaves in the lower whorl. Leaves in whorls of threes, almost covering branchlet, pointing forward, scarcely spreading. Fruit, three-seeded.

A juniper species recently collected by Wilson in Northern Japan, where (Sargt., "A. A. Bullet.," 18) it covers with long prostrate stems the sand-dunes of the coast. There are only young plants at present in cultivation, but these appear to be hardy in British Isles and East U.S.A.

J. procumbens, Sieb. ("Ann. Soc. Hort. Pays-bas," 1844, p. 31).

Syn.: *J. Chinensis*, var. *procumbens*, Endl. ("Syn. Conif.," 1847).

In the absence of fruit, Henry (E. and H., vi. 1422) tentatively describes this to be a variety of *J. squamata*. It differs from that plant in having its branchlets glaucous white on the edges of the pulvini. Leaves longer, gradually tapering to a spire-like apex; upper side concave, with broad white stomatic band divided, except near apex, by an elevated midrib; lower side convex, bluish spotted with white, with a median furrow of variable length.

Stated by Siebold to be wild in mountains of Japan, and found by Faurie high up in Hondo. It has long been grown in Japanese gardens, and is now frequently imported from Japan. It is a very ornamental prostrate shrub.

J. recurva, var. **densa**, Carr. ("Man. des Plantes," iv. 310).

Syn.: *J. densa*, Gord.

J. recurva nana, Hort. (Beiss., ii. 583).

This bushy dwarf form is described by Beissner on Gordon's authority. Elwes and Henry (vi. 1420) point out that with the exception of the berries being three-seeded, Gordon's description applies to *J. squamata*; certainly one invariably receives *J. squamata* for "*recurva densa*" when the latter name is catalogued, and I have never seen any other that might be identified with it.

J. Sabina, Linn.

The common savin rarely exceeds 10 feet in height, and may therefore be utilised for a time. It comes from Central and Southern Europe.

J. Sabina, var. tamariscifolia, Aiton ("Hort. Kew.," iii. 414, 1789).

This form, commonly known as the Spanish Savin, but occurring also in Sicily, Roumelia, and Greece, makes a low-spreading shrub of ascending branches, bearing both juvenile and adult foliage of a glaucous blue-green. This soon covers a wide space. In Glasnevin Botanic Gardens are two very old specimens, one of typical growth, the other with a leader artificially trained up, making a very low wide pyramid.

J. Sabina, var. humilis, Endl. ("Syn. Conif.," 23).

Syn.: var. *cupressifolia*, Ait.;

var. *nana*, Carr.;

var. *femina*, Hort.

A pretty, compact, very dwarf form bearing both juvenile and adult foliage. Branches upright and wide-spreading, 1 to 2 inches in height. Branchlets crowded. This form soon spreads over the ground, and is commonly known as the "carpet juniper." The juvenile foliage is very fine and fern-like.

J. Sabina, var. humilis aurea variegata.

A sport which occurred in my own garden; a portion of an old specimen which layered itself, producing branchlets with, in some cases, entirely golden foliage, and in others with a considerable portion of the foliage golden-yellow.

Two other forms of *J. Sabina* near to var. *humilis* are vars. "*Knap Hill*" and "*Von Ehren*."

J. Sabina, var. variegata, Hayne ("Dend. Fl.," 204, 1822).

A slow-growing form of the type, making a small upright shrub; branches crowded; foliage tipped with white.

Here one must mention—

J. horizontalis, Mönch ("Meth. pl. Hort. et Agr.," 699, 1794).

Syn.: *J. prostrata*, Pers. (1807).

J. Sabina prostrata, Loud.

J. repens, Nutt.

J. Hudsonica, Forb.

This, the American form of *J. Sabina*, is widely distributed over North America from the coast of Massachusetts to British Columbia (Sargt., "Bull.," No. 18). Unlike most junipers, this form is found on non-calcareous soils. It has long prostrate stems and soon spreads into a fine mass. Its foliage is very glaucous green-blue. Professor Sargent sent me cuttings of one particularly fine-coloured form, its foliage being steel blue.

J. squamata, Buch.-Hamilton (in Lambert, "Genus 11, 17).

Syn.: *J. densa*, Gordon.

J. recurva squamata, Parl.

J. Morisinocola, Hayata.

Old branchlets red-brown with dead red-brown leaves. Young branchlets green. Leaves acicular; densely imbricated in whorls of threes, appressed or slightly spreading; curved, tapering to acute sharp-pointed apex. Upper side concave, white with faint green midrib; under side convex with a median furrow from base to near apex. Fruit red-brown to black; seed solitary and ovoid.

A broad low shrub with long procumbent stems from which appear occasional smaller upright branches. From seed collected by Wilson (No. 985) I have a perfectly erect form throwing up several leaders, of which the centre one is the tallest; and from the same seed I have a perfectly prostrate form which differs from the type sufficiently to be described.

J. squamata, var. prostrata.

Old branches red-brown, young branchlets green. Branchlets point directly forward and do not curve or droop.

Leaves in whorls of threes, all acicular, more spreading, not so incurved, narrower, slightly keeled below. Above, glaucous band much narrower, and green leaf margins correspondingly broader. Colour of glaucous bands not a dull white but a brilliant blue-white.

This is a male plant and makes a prostrate mat of horizontally spreading branches. The spreading habit of the leaves enables their glaucous side to appear to advantage. A most attractive form, which I got from Wilson's collected *J. squamata* seed.

J. Virginiana.—The so-called red cedar of the Eastern and Central States of America varies considerably from seed, so it is not surprising that nurserymen have put in commerce numerous "named" forms, many of which are hardly distinct enough to be enumerated.

J. Virginiana, var. dumosa, Carr. ("Conif.," i. 45).

A thick bushy roundish pyramid, with short erect branchlets. Leaves crowded, mostly needle-like 4 to 10 mm. long, opposite, decussate, or in threes. Scale-like foliage is rare, oval, pointed, very rarely obtuse.

J. Virginiana, var. Cannarti, Beiss. (ii. 125).

Syn.: var. *Canaertii* Sénéclauze ("Conif.," 99, 1868).

A compact form, forming a broad crown of dark green foliage.

J. Virginiana, var. Kosteriana, Beiss. (i. 126).

A wide-open spreading bush with 2 to 3 feet arching branches, of wonderful glaucous plum-coloured foliage.

J. Virginiana, var. interrupta, Beiss. (i. 125).

A low-growing dense pyramid with very fine, almost needle-like foliage.

J. Virginiana, var. nana nivea, Beiss. (i. 126).

A compact dwarf form with whitish foliage.

J. Virginiana, var. globosa, Beiss. ("Mitt. d. d. d. Ges.," 134, 1904).

Beissner describes this as a compact round-topped bush rather taller than broad, with crowded branches.

There is no reason to doubt the existence of a globose form among the ever-varying seedling forms of this inconstant juniper, but any forms grown under this name that I have met have been a form of *J. Chinensis* (q.v.). I have recently received an undoubted form of *J. Virginiana* said to be var. *globosa*, but the plant is too small to enable one to determine its habit.

J. Virginiana, var. tripartitia, Beiss. (i. 126).

A low-growing form with crowded, spreading, and somewhat arching branches; short branchlets and blue-green leaves. There is a golden foliated variety of this form.

J. Virginiana, var. Schotti, Beiss. (ii. 595).

A pyramidal bushy dwarf form with pointed scale-like foliage of very pale glaucous green.

J. Virginiana, var. reptans, Beiss. (ii. 596, ex "Mitt. d. d. d. Ges.," 1896, 55).

A prostrate form in the Botanic Gardens at Jena with branches spreading over the ground.

Professor Sargent ("A. A. Bullet.," No. 18, 72) records a prostrate form in the Arnold Arboretum found growing wild on the seacoast cliffs of Maine. Plants of this form 18 inches high have prostrate stems which spread into dense mats 15 feet across.

J. Virginiana, var. humilis, Loddiges (Cat., 1836); Carr. ("Conif.," ii. 46).

A very dwarf bushy shrub. Rather delicate branches. Branchlets and sprays very slender.

J. Virginiana, var. monstrosa, Carr. ("Conif.," ii. 46).

Carrière describes this as a variety remarkable for the considerable quantity of "witches'-brooms" which issue from all its parts, and which gives the whole bush a singular appearance.

J. Virginiana, var. aurea, Nelson ("Pinao," 196, 1866).

A slow-growing form, making a low-spreading shrub of bronzy gold adult foliage.

LARIX.

Larix Europea, D.C.

The common larch has been described and noted for nearly 200 years, and in addition to the common larch there are over a dozen other species, but between them all they have supplied only three dwarf and two prostrate varieties, none of which I have seen.

Larix Europea, var. compacta, Beiss. (ii. 317).

A short, compact conical bush with crowded branches.

L. Europea, var. Kellermanni, Carr. ("Conif.," ii. 359).

A bushy dwarf form with very short, thick branches crowded with leaves.

L. Europea, var. cervicornis, Beiss. (ii. 317).

A distinct stunted form with antler-like branches, found by Dr. Dieck in Zoschen.

L. Europea, var. repens, Willk. ("Forst. Fl.," ii. 143, 1887).

A prostrate form with branches creeping over the ground.

L. dahurica, var. prostrata, Rgl. ("Gartenfl." 105, 1871).

Syn.: *Pinus adhurica*, Endl. ("Conif.," 128, 1847).

PICEA, Lk.

The dwarf spruce firs are the backbone of the pygmy arboretum. There are over sixty dwarf forms of *P. excelsa* alone.

Picea alba, Lk. (1841).

Syn.: *P. Canadensis*, Brit. and Sargt. (1898).

P. glauca, Mönch.

The white spruce inhabits North America, and is widely distributed through Canada from the Arctic regions to the State of New York. The few dwarf forms it has given us are among the best. *P. alba*, var. *echinæformis*, is particularly desirable.

P. alba, var. *nana*, Carr. ("Conif.," 239, 1855).

Syn.: *Abies alba prostrata*, Hort.

Abies alba nana, Loud. ("Encyclop. of Trees," 1030; 1838).

Buds like the type but small, $\frac{1}{8}$ to $\frac{1}{4}$ inch. Branchlets, annual growth about 1 inch, very numerous and close-set; glabrous; shining white; stiff. Leaves short and stiff and nearly appressed; arranged radially, but fewer underneath; almost uniform in width, ending abruptly in a short, blunt point.

I have noticed in my garden that the buds on this form do not all come out in the spring together, but a certain proportion come out from time to time in succession all through the summer.

A round compact bush, according to Elwes and Henry rarely 6 feet high. I have a specimen about 4 feet by 5 feet through.

P. alba, var. *nana glauca*, Hort.

Appears to differ only in the colour of its leaves, which are very glaucous blue.

P. alba, var. compressa, Beiss. (ii. 342).

A seedling ornamental dwarf form of very dense slow growth and bluish foliage, which was raised in the nursery of Lobkowitzshen in Eisenberg, Bohemia.

P. alba, var. compacta gracilis, Breinig (Beiss., ii. 343).

Syn.: var. *Compacta pyramidalis*, P. Smith (Beiss., ii. 343).

A compact densely branched conical dwarf form with beautiful blue-grey foliage and very brown buds—one introduced by Herr Breinig of Mülheim, and a similar one, under the second name, by Peter Smith of Bergedorf.

A seedling form in Mr. Hunnewell's arboretum at Wellesley, Mass., seems very near to this, and may thus be described:

Buds ovoid or conical, light brown, $\frac{1}{5}$ to $\frac{1}{4}$ inch; bud scales usually pointed with bifid tips.

Branches and branchlets stiff and ascending, very crowded, white or grey-yellow, stiffer and stronger in growth than those of var. *nana*. Annual growth 1 to 4 inches. Leaves very crowded, radial or semi-radial, pointing forward and slightly out; about $\frac{1}{2}$ inch—thinner and longer than those of var. *nana*, tapering to a longer and narrower point, very glaucous, about four on each side. Judging from photographs, this has made a dense pyramidal bush about 4 feet by 4 feet.

P. alba, var. pendula, Carr. ("Conif.," 321, 1867; Beiss., ii. 272).

A striking decorative luxuriant form with stout pendulous branches; crowded red branchlets; blue-white leaves and widespreading growth. I cannot trace this form in cultivation. The description is Beissner's.

P. alba, var. echinæformis, Carr. ("Conif.," 289, 1853).

Buds narrowly conical, $\frac{1}{8}$ to $\frac{3}{16}$ inch, with glabrous non-ciliate scales, rounded and bifid at tips, pale whitey-brown.

Branches crowded and ascending at an angle of about

45 degrees. Branchlets very fine and densely crowded. Annual growth $\frac{1}{2}$ to $\frac{3}{4}$ inch; glabrous white-yellow. Leaves radial, pointing forward at an acute angle. Quadrangular, stout, incurved, or straight with usually rounded cartilaginous tip; stiff, about $\frac{3}{16}$ inch long, emitting strong unpleasant odour when crushed. Very glaucous blue-green; about three stomatic lines on each side.

A dense flat-topped dwarf bush of ascending branches and branchlets. Very distinct on account of its unusually glaucous light blue-green foliage. It is of slow growth and grows wider than high, forming a low cushion. My best specimen is about 14 inches high and 32 inches wide. This form of *P. alba* is now extremely rare.

P. alba, Lk., var. **Albertiana**, forma **conica**, Rehder.

Syn.: *P. Albertiana*, Stewardson Brown, var. *conica*.

Buds ovate, minute, light brown, slightly resinous; bud scales ovate with entire apex. Terminal bud girt with a ring of acuminate keeled scales with long points.

Branchlets very fine and flexible, shining cream-yellow, with pubescence usually in grooves between pulvini. Annual growth $\frac{1}{2}$ to 1 inch.

Leaves relatively long—over $\frac{1}{2}$ inch, very thin and fine, but roundish; arranged imperfectly radially and not very close together; fewer below, curved, uniform width, ending in a cartilaginous point; light glaucous green, with two to three stomatic lines on each side.

A most distinct plant; foliage as fine as juvenile forms of *Thuya orientalis*. The parent tree is in the Arnold Arboretum. It was found in the Canadian Rockies at Lake Laggan in 1904 by Mr. J. G. Jack, of the Arnold Arboretum. According to E. H. Wilson (*Garden Magazine*, September, 1920, p. 38), it is of narrow pyramidal growth, with short close-set twiggy branches covered with pellucid grass-green leaves, and much resembles *Kochea Scoparea*; it requires a moist, shady situation and protection from cold winds.



PICEA ALBERTIANA, FORMA CONICA, AT THE BAYARD PINETUM, SOUTH LANCASTER, MASS.



P. Engelmanni, Engl.

Is an Alpine species of the mountains of Western North America. Introduced in 1863 and reaching 150 feet in height; it is not unlike *P. pungens*, but is distinguishable by its softer leaves and downy shoots.

P. Engelmanni, var. microphylla, Hesse (Beiss., ii. 276).

A compact, branching dwarf form with leaves much smaller than the type; raised in the nursery of Hesse at Weener, East Friesland. This form does not appear to be in cultivation.

Picea aurantiaca, Mast., var. Hunnewelliana.

Among the seedlings raised from seed collected by Wilson in China there appeared, at the Wellesley Pinetum, Mass., one which has retained a dwarf habit. I have only seen a photograph of it. It has made a low, dense cushion. Branches stout and ascending with decurving tips.

P. excelsa, Link.

One might readily fill a good-sized garden with the forms of the Norway spruce. This is one of the earliest known conifers, and has been cultivated in Great Britain for some hundreds of years, and in every batch of seedlings variations of habit and colour may usually be found: of dwarf forms there are about sixty in cultivation.

New forms are constantly appearing in seed beds or are discovered in cultivation. Some of these were distinct enough to secure a name of their own, but many others have strayed into cultivation, masquerading as well-known forms for which there happened to be a demand, and in addition to all the varieties described there are a certain number of indistinct forms in cultivation which cannot be separated from forms to which they are closely akin.

In the middle of the last century, when the known forms were few, most nurserymen propagated their own stock

and sent them out true, but of recent years the American and British markets have been largely supplied by Continental nurserymen. Neither the grower nor the importer seems to have worried about the verification of the names, and the result has been chaos. There appear to be a few forms on the Continent, usually coarse and strong-growing, and probably selected as being quicker to make "saleable sized" plants, which are sent over under any "names" that the buyer may suggest. One form in particular, with stout red branchlets and large coarse red buds, is bound to be included in every consignment. It is close to var. *pyramidalis compacta*, but usually masquerades as vars. *Gregoriana* *Clanbrasiliana* and *pygmæa*. A few old-established Continental and British nurseries still propagate their own stock from original specimens, but I regret to say that from most nurseries one may as a rule expect to receive few *P. excelsa* forms truly named. When one is attempting to collect known forms, one unfortunately has to search every nursery that stocks them, and the amount of rubbish I have received has been truly astonishing. One or two forms that I deemed to be lost to cultivation turned up unexpectedly, but as a rule these cheap grafted Continental forms turned up regularly, and one well-known nursery that had first sent me sample branches of the forms it "grew" sent me, on my ordering two plants of one form, two plants differing not only from the sample branch, but also from each other.

Such carelessness is inexcusable, but one can well excuse mistakes in the identification of some forms when one comes to trace out their earliest recorded descriptions; for instance, a nurseryman might well be excused for sending out practically any dwarf form in his collection for var. *pygmæa* if he had access only to Loudoun's description of it, for all that he says is that it is "said to be dwarfer than var. *Clanbrasiliana*"; and many of these early authorities are equally vague. Beissner in

modern times has taken more trouble in describing these forms than any of his predecessors, but in many cases he does not enter sufficiently into detail to enable one to distinctly identify a form; and this is unfortunate, as most of his descriptions appear to be of forms which he himself had actually seen, and in the absence of adequate identification and of their locality, many of them are lost to us and cannot be traced. It would also appear from other of his descriptions that already many false forms had crept into the Continental nurseries, and that he therefore, at times, described not the true but the existing "trade" form—an example of this is his var. *Gregoriana*. What percentage of his descriptions is unreliable on this account is now impossible to say, and many of his descriptions have had to be incorporated without the chance of verification, but fortunately there are still, as I already mentioned in my General Preface, occasional specimens in existence which from their age or other circumstances may be regarded as probably authentic and original, and from these it has been possible in some cases to verify or correct his descriptions. A case in point is the var. *Gregoriana* already mentioned. There is a very old plant of this at Kew, and an identical form to this was propagated and distributed for, anyhow, forty years by Veitch. Having regard to the age of this form, and also to the fact that it fulfils all the conditions (and they are not many) of the earliest recorded description—that of Gordon—one may assume that the Kew form is probably the true one, and that Beissner's, which was first described in 1891 and differs considerably, is not true.

While many of the true forms are very difficult to procure, there are too many false forms for existing authentic names; and for some, which are definitely separated from their assumed names of the trade and cannot be identified with any other recorded description, new names have been found.

Considering their number, it is astounding how many of

the forms in cultivation are sufficiently distinct from one another to be readily identified, but a certain number of them resemble others either in habit or colouring of branchlets, etc., to such an extent that some rough classification like that which follows may simplify their identification:

Group I.

Branchlets usually shiny, light orange-yellow; stiff and irregular in size.

Buds roundish and usually orange-yellow.

Leaves radial, dark to yellow-green; variable in size; thick and roundish.

Var. *nana*.

Var. *dumosa* (of Kew, not Carrière). White branchlets.

Var. *capitata*.

Var. *Maxwelli* (of Beissner, not Maxwell). Mahogany-coloured branchlets.

Var. *Maxwelli* (of Maxwell).

Group II.

Branchlets very fine and small, grey-white or grey-yellow.

Leaves needle-shaped, more or less radial.

Buds minute and obtuse; usually lighter coloured in centre of bud. Habit low and cushion-like.

Var. *Gregoriana*.

Var. *humilis*.

Var. *pygmæa*. Occasional extra stout branchlets.

Var. *echinæformis*.

Group III.

Branchlets fine, white and shining.

Buds conical and very red. Leaves fine, flattish, acuminate, tapering to sharp point; usually pectinately arranged.

Var. *Clanbrasiliana*.

Var. *Clanbrasiliana stricta*. (Leaves radial.)

Var. *Clanbrasiliana elegans*.

Var. *brevifolia*.

Group IV.

Buds conical, large, dark red. Branches very stiff and stout, reddish. Branchlets stiff, reddish, in fan-shaped groups, bending up and forming a cup. Leaves dark green, stiff, and sharp-pointed. Habit more or less pyramidal and free-growing.

Var. *mucronata*.

Var. *pyramidalis compacta*.

Var. “*Gregoriana*” of the trade. Flatter top. (This form is rarely absent from a Continental consignment, and may be received under any name.)

Var. *microsperma*.

Var. *decumbens*.

Group V.

Habit diffuse and spreading, much wider than high; foliage various shades of blue-green. Leaves pectinate.

Var. *pumila*.

Var. *diffusa* (of Kew).

Var. *Sargenti*.

Var. *pseudo-Maxwelli*.

Var. *nidiformis*.

Var. *Merkii*.

Group VI.

Pendulous or procumbent.

Var. *pendula*.

Var. *tabulaeformis*.

Var. *inverta*.

Var. *procumbens*.

Var. *dumosa* (Carr., not Kew).

Var. *repens*.

Var. *prostrata*.

Var. *reflexa*.

In order to facilitate the acquisition of forms of *P. excelsa* I append a few names under which some of its forms may be found in nursery catalogues, but it is always advisable to see a plant, or a branch of it, before purchasing it,

as the naming of these forms by nurserymen appears to be usually a matter of chance.

VARIETY.	NAMES UNDER WHICH IT IS SOMETIMES FOUND IN CATALOGUES.	
<i>Clanbrasiliana</i>	..	vars. <i>pygmæa</i> , <i>parviformis</i> , and <i>brevifolia</i> .
„ <i>stricta</i>	..	vars. <i>parviformis</i> , <i>compacta</i> , and <i>pygmæa</i> .
<i>Decumbens</i>	..	var. <i>dumosa</i> .
<i>Echinæformis</i>	..	var. <i>pygmæa</i> .
<i>Microsperma</i>	..	var. <i>mucronata</i> .
<i>Mucronata</i>	..	var. <i>pseudo-Maxwelli</i> .
<i>Nana</i>	..	vars. <i>pygmæa</i> , <i>Gregoriana</i> , <i>Clanbrasiliana</i> .
<i>Pygmæa</i>	..	vars. <i>Clanbrasiliana</i> and <i>globosa nana</i> .
<i>Gregoriana</i>	..	var. <i>echinæformis</i> .

The following forms are frequently sent out in substitution:

Var. <i>pyramidalis</i>	..	for vars. <i>Gregoriana</i> , <i>Clanbrasiliana</i> , <i>Merkii</i> , <i>pygmæa</i> , and <i>nana</i> .
Var. <i>elegans</i>	..	for var. <i>Remonti</i> .
Var. <i>pseudo-Maxwelli</i>	..	for vars. <i>Maxwelli</i> , <i>mucronata</i> , and <i>dumosa</i> .
Var. <i>pygmæa</i>	..	for vars. <i>Clanbrasiliana</i> , <i>nana</i> , <i>humilis</i> , and <i>parviformis</i> .
Var. <i>Ellwangeriana</i>	..	for var. <i>Clanbrasiliana</i> .
Var. <i>microsperma</i>	..	for vars. <i>Clanbrasiliana</i> , <i>mucronata</i> , and <i>tabulæformis</i> .
Var. <i>nana</i>	..	for vars. <i>Gregoriana</i> and <i>pygmæa</i> .

P. excelsa, var. brevifolia.

Syn.: *Abies excelsa brevifolia*, Cripps (Gord., "Pinetum," 8, 1875).

Picea excelsa nana, Beiss. (not Carr.) (ii. 235).

A variety under this name is recorded by Gordon, who calls it var. *brevifolia*, Cripps. This variety Beissner (ii. 235) identifies with var. *nana*, Carr., but distinguishes from these a var. *brevifolia*, Wittrock, in Hartman ("Handl. Skand., Fl.," ed. 12, 35, 1899). I can find no trace of this

Wittrock form or any description of it. There is also a *P. excelsa*, var. *brevifolia*, Kuntze ("Taschenfl.," Leipzig, 7, 1867).

Gordon's description of var. *brevifolia*, Cripps, is: "A distinct pygmy with very minute leaves." In Beissner's description of var. *nana* he states that it has short branchlets, and often monstrous ones on the top with thick buds and leaves. To anyone who has grown var. *nana* these outcropping monstrous branchlets with their large leaves are well known; they are one of the most distinctive characteristics of this variety, and it seems incredible that they should have escaped Gordon's notice. One can only conclude that var. *brevifolia*, Cripps, with its minute leaves, is not identical with var. *nana*, but Gordon's description is so inadequate that, having failed so far to discover any old specimen of this variety, I cannot say whether it is any longer in cultivation.

Recently I received from an old Continental nursery a form grown by its owner as var. *brevifolia*, Cripps, but I can discover neither its history nor its habit as an adult specimen, and my plant is quite small. So far, however, it is fairly distinct; its branches, branchlets, leaves, and buds are similar in every respect with those of var. *Clanbrasiliana*, but the leaves are even smaller. In habit, it sends up no central leading shoot, but a number of erect branches from its base which spread out as they ascend, forming a low bush wider at the head than at the base and being, so far, absolutely flat-topped. The leaves are mostly arranged radially on the branchlets. This is undoubtedly a *Clanbrasiliana* form, but may possibly be var. *brevifolia*, Cripps; at present we must leave it at that.

***P. excelsa*, var. *brevifolia argentea*.**

Syn.: var. *nana argentea*, Hort;
var. *pumila argentea*, Hort.

Buds.—Conical; minute, orange-brown; non-resinous.

Branches.—Thin; slightly ascending; few in number.

Branchlets.—Thin; flexible, rather pendulous; glabrous; light shining orange. Annual growth 1 to 2 inches. Few in number.

Leaves.—Arranged pectinately; very regular; branchlets bare and thin beneath; leaves very crowded on top. Those at sides pointing out and forward at angle of about 35 degrees. Those above pointing forward and almost appressed to branchlet. Very uniform in size; very short—under $\frac{1}{4}$ inch, rather flat, rigid; tapering very abruptly to a sharp point; green beneath and white-yellow (like those of var. *Finedonensis*) above.

The plant above described is sent out as a sub-variety of vars. *nana*, Carr., and *pumila*, but it is not the least like either of them; its very short flat abrupt leaves are distinct, and, failing an authentic name, the name *brevifolia* fits it better than any other. It grows slowly and makes a low pyramid of very open habit.

P. excelsa, var. *Clanbrasiliana*, Carr. ("Man. des Plantes," iv. 341, 1857).

Syn.: *Abies excelsa Clanbrasiliana*, Loud. ("Ency. of Trees," 1027; 1842).

Buds.—Small— $\frac{1}{8}$ to $\frac{3}{16}$ inch, conical, acute, bright shiny red-brown.

Branches and Branchlets.—Very short and crowded. Branchlets, annual growth $\frac{1}{4}$ to $\frac{1}{2}$ inch; glabrous, shiny white, very thin and fine.

Leaves.—From pectinate to nearly radial. If radial, those below point forward and then curve almost directly downward; if pectinate, lower ranks point out and forward at angle of about 45 degrees. In both cases those above crowded so as to nearly conceal branchlet. Slightly appressed and pointing almost directly forward, thin, flattish; acuminate; length $\frac{1}{8}$ to $\frac{3}{8}$ inch; very bright shiny green; widest in middle, tapering to a very fine point.

A compact low dense bush, usually growing slightly wider than high; very slow in growth, and in time forming



PICEA EXCELSA, VAR. CLANBRASILIANA, AT ABBEYLEIX HOUSE,
QUEEN'S CO.

a rather flat-topped round bush not unlike a Cheddar cheese; rarely exceeding 6 to 7 feet in height—if it does, it is usually a beehive-shaped bush.

This, the oldest recorded dwarf form of *P. excelsa*, is nevertheless one of the most difficult to obtain; it is not uncommon in cultivation, but is rarely sent out, or found growing, under its own name. I have received it as vars. *pygmæa*, *brevifolia*, *compacta nana*, and “*parviformis*,” and have received under its name vars. *pyramidalis Merckii*, *nana*, etc. Discovered originally on the Moira Estate, near Belfast, in the last half of the eighteenth century, it is said to have been moved by Lord Clanbrasil to his seat at Tullymore, Co. Down, and later introduced by him to England. What is said to be the original plant, or portion of it, is still growing at Tullymore Park, Co. Down, now the seat of the Earl of Roden. The description of the form is taken from specimens off this old tree. It was measured by Elwes about the year 1911, and was then 10 feet high by 28 feet in circumference. Since then one side has been encroached upon by other trees, and it has lost some of its lower branches. Nevertheless its diameter, 4 feet from the ground, is now 10 feet 1 inch, and its height is 11 feet 5 inches. This rate of growth for nine years is unusually strong, and is partly accountable by the fact that portions of the tree are beginning to revert, and these portions had not, at the time of measurement, been cut away. This tendency to revert is noticeable in other dwarf forms of *P. excelsa*, especially in var. *Ellwangeriana* (Sargent, “Arnold Arboretum Bulletin,” No. 18). At Aldenham and Coles, in Hertfordshire, var. *Clanbrasiliana* sent up leaders and became arborescent. Probably the oldest existing propagation of this plant is one in the neighbouring garden of Castlewellan, Co. Down. This plant is described by Lord Annesley (“Beautiful and Rare Trees,” p. 33, 1903) as being over 100 years of age, a round bush 4 feet high by as much through. Six old specimens—over seventy years planted—at Abbeyleix

House, the seat of Viscount de Vesci, in this county, send out occasional arborescent side branches which are removed. The plant is sterile, and Loudon ("Trees and Shrubs," 2259) suggested it was not a seedling form but propagated from a "witches'-broom." Elwes and Henry, however, state (vol. vi.) that it has been found growing wild in Thuringia and Sweden. The arborescent branchlets of the Tullymore plant are yellow, not white; and this is curious, as at the neighbouring garden of Castlewellan are two old specimens said to have come originally from Tullymore, and similar in every respect to that plant save that one of them has yellow branchlets and the other white. The specimen at Kew is 5 feet 6 inches, and three of the old specimens at Abbeyleix measure respectively 4 feet 6 inches by 8½ feet, 4 feet by 5 feet, and 3½ feet by 5 feet.

***P. excelsa*, var. *Clanbrasiliana stricta*.**

Syn.: *Abies excelsa Clanbrasiliana*, var. *stricta*, Loud. ("Trees and Shrubs," 2295; 1838).

This interesting form was first recorded by Loudon, who states that it was found in the park at Florence Court, Co. Fermanagh (the seat of the Earl of Enniskillen), by Mr. Young, the gardener there, who, in 1834, sent Loudon a specimen to see. Loudon described it as having a clear stem about 1 foot high, surmounted by a head, making a narrow, ovate conical bush with shoots of upright and more rapid growth. Specimens of this form were also sent to one or two private gardens, and it is quoted for sale in nurserymen's lists up to, at any rate, 1876. But the name is no longer to be found in any catalogue, and enquiries made at Florence Court failed to elicit any satisfactory information, and I was under the impression that this form was no longer in cultivation, when I received a specimen of it from a very old-established English nursery under the name of var. *pygmæa*. Of all forms of *P. excelsa*, I have long since discovered that catalogue

names are absolutely untrustworthy, and have consequently persevered in the acquisition of "named" varieties on the chance of receiving some new or rare form. Too frequently one receives only one of the usual Continental masqueraders, but occasionally, as in this case, one is repaid by a "find."

This false "*pygmæa*" answers exactly to Loudon's description. Buds, branchlets, and foliage exactly like var. *Clanbrasiliana*, but branchlets about as long again, their annual growth being about $\frac{3}{4}$ to $1\frac{1}{2}$ inches. Branches and branchlets ascending at a very narrow angle, and making, as he describes, a narrow ovate conical bush.

It is curious that Florence Court should have produced both the fastigiata Yew and this fastigiata form of var. *Clanbrasiliana*. My specimen is about 3 feet by 2 feet.

P. excelsa, var. **Clanbrasiliana elegans**, Sénéclauze ("Conif.," 25, 1868).

Syn.: var. *compacta pyramidalis*, Beiss. (ii. 363) (not Kew);

var. *compacta nana*, Hort.

Buds.—Ovoid, about $\frac{3}{4}$ inch, red-brown, borne in ones, twos, threes, and fours.

Branchlets.—Crowded, irregular in number on branches; ascending; fairly stout and rigid, shiny white-grey. Annual growth, 1 inch to $2\frac{1}{2}$ inches.

Leaves.—Imperfectly radial, growing thicker on top and irregular in direction—on some branchlets pointing out, on others pointing directly forward.

Leaves widest near base, tapering from middle to sharp apex; bright green, up to $\frac{3}{8}$ inch.

A compact pyramidal or broadly conical bush closely related to var. *Clanbrasiliana*, which it resembles in colour of leaf, branchlets and buds, and shape of leaf. It is, however, much faster in growth, and is more irregular and looser in habit.

This form is occasionally met with under the name of

var. *compacta*, and Beissner's short description of var. *compacta pyramidalis*—"a compact pyramid with short branches and short pointed leaves"—covers it, as far as it goes, but he says nothing about its foliage, branchlet colour and buds being identical with those of *Clanbrasiliana*, which is the case. Having regard to its close affinity to var. *Clanbrasiliana* (type) and its var. *stricta*, I prefer for it the name of var. *Clanbrasiliana elegans*, a name existing for a long time in Kew, but at present attached to a straggly indefinite form in no way resembling the variety.

P. excelsa, var. "*Clanbrasiliana*" *plumosa* of Beissner (ii. 234.)

Beissner records a plant thus named forming a compact cone, with short sturdy branches; stout, rather curved leaves arranged spirally and twisted, especially at the points. The buds enveloped with leaves, the whole plant having a rather "curly" look.

This appears to be a very distinct form. I have not seen it, and there is no record of where Beissner saw it, and in the absence of definite proof I hesitate to class this as a *Clanbrasiliana* form. On the whole, the chances are against it being a variety of that form. In the first place, its "stout" leaves seem similar to Beissner's erroneous description of var. *Clanbrasiliana* (which he describes as having "short *thick* leaves," whereas the leaves of all the true *Clanbrasiliana* forms are exceptionally thin and fine).

In the second place, Beissner's note on var. *Clanbrasiliana* (type) (ii. 232), with the exception of that part of it which refers to the early history of this form, seems to point to an examination by him of one of the false Continental forms frequently sent out as var. *Clanbrasiliana*, and not of specimens of the true form. Only once have I received the true form from the Continent, and his reference to a supposed example of var. *Clanbrasiliana* planted in 1870 in the Pinetum at Weißenstephen, and in

1909—39 years later—18 feet high by 16 feet broad, increases my distrust of the plants he examined under that name, for the original plant of the true *Clanbrasiliana* at Tullymore, which is over 100 years old, has only grown 11 feet (including tall “reverting” branches) in that sheltered genial climate, and the three seventy-year-old bushes at Abbeyleix House are all under 5 feet in height.

P. excelsa, var. Knaptonensis.

Buds.—Varying from $\frac{1}{16}$ to $\frac{3}{8}$ inch, conical, acute, very bright red.

Branches and Branchlets.—Densely crowded and spreading horizontally. Branches slightly ascending; branchlets slightly drooping, the whole making a flattish cushion about 12 inches high by 24 inches through; branches and branchlets stout and flexible.

Main branchlets, annual growth only $\frac{1}{4}$ to $\frac{1}{2}$ inch, spreading fanwise from the branches, so crowded as to overlap each other, and having smaller secondary branchlets growing in thick clusters from the tips of the main branchlets, and also sprouting out all along the upper sides of these main branchlets, in such a manner that the main branchlets appear covered with these secondary branchlets as if with leaves. These secondary branchlets are of almost imperceptible length, are surmounted by a single bud surrounded by leaves—the whole being under $\frac{1}{8}$ inch and set upright at right angles to the branchlet. The extraordinary density of these branchlets makes the plant absolutely impenetrable to light and almost to moisture; consequently all inner portions of branches and branchlets, lower than the second layer from the top, are dead, but owing to the cushion shape of the plant this is imperceptible until the living foliage—which sits tightly on the dead—is raised. The branchlets are bright orange-yellow and glabrous.

Leaves.—Radial, very short— $\frac{1}{16}$ to $\frac{1}{4}$ inch—and thick, narrowest at base, from thence gradually widening to

upper third; apex is blunt and abrupt. Leaves slightly incurved, almost spatulate; about three stomatic lines on two sides, and five to six on others; rather glaucous yellow-green.

This remarkable form I found growing as a "witches'-broom," on a common spruce in this county. It was a flattish pie-crust-like growth on the side of an old branch, and evidently of considerable age. As it has only recently been propagated, it is too early to note whether its absolutely divergent habit will be maintained. On the original growth the whole surface is dotted with the curious secondary branchlets described above.

P. excelsa, var. Gregoriana.

Syn.: *Abies excelsa Gregoriana*, Gord. ("Pinetum"),
ii. 9.

Buds.—Minute, globose or ovoid; outer scales dark brown, those on top much lighter; terminal buds usually surrounded by a ring of dark brown scales with very long points.

Branches.—Short, crowded, and spreading.

Branchlets.—Very crowded, mostly pointing forward at a narrow angle; very thin and fine; annual growth $\frac{1}{4}$ to $\frac{1}{2}$ inch; white or grey-brown, with slight erect scattered pubescence mostly in the grooves between the pulvini; branchlets slightly drooping.

Leaves.—Narrow, round, needle-shaped, $\frac{1}{4}$ to $\frac{1}{2}$ inch, uniform in width, abruptly tapering, arranged radially on ALL the branchlets, irregular in direction, mostly pointing slightly forward, but some at right angles. On some very small branchlets the leaves are borne in tufts similar to those of a larch. Colour, pale grey-green, two to three stomatic lines on each side.

A very dwarf form, rarely exceeding 2 feet in height, making usually a low humped or conical bush. Raised in the Cirencester Nurseries, England, about 1860.

Possibly no other variety of *P. excelsa* is more often

listed than var. *Gregoriana*, and it is rarely found true. It is a very distinct variety, and of it there appear to be at least three, if not four, forms. Only one of these—that described above—has the typical needle-like foliage, arranged radially ALL OVER THE PLANT. This form is very rare in cultivation, and I know of only two old specimens of it: one at Kew, over thirty-five years old, is now 18 inches by 21 inches; the other is in the gardens of Mr. D. Pack-Beresford, of Fenagh, Co. Carlow. This he purchased from Veitch in 1900, and it is now a low round-headed bush only 15 inches by 16 inches. I have young plants, but they are extremely slow-growing.

The second form we must distinguish as—

P. excelsa Gregoriana forma Veitchii.

This form is very close to the first, but differs in these respects: (1) Its foliage is needle-like and radial only on the upright leading shoots, but upon the side branchlets they are thinner and flatter, and are either semi-radial or pectinate in arrangement. (2) The branchlets are longer, making an annual growth of from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, and are flexible and more inclined to droop. (3) The plant is more vigorous in growth, and makes a larger, less compact, and broader conical bush. A plant of this form at Kew, of about the same age as the first, is now 3 feet by 4 feet 6 inches, and a still finer specimen in the Dwarf Conifer Collection at Highlands Park, Rochester, New York, is 3 feet 6 inches by 6 feet in diameter.

This is the form of var. *Gregoriana* most frequently found in cultivation, and its origin is obscure; both it and the first form were sent out by Veitch twenty-five years ago as var. *Gregoriana*. In a young state the needle-like radial foliage predominates, and it may well be the case that Veitch, either having raised this form himself or having obtained it elsewhere, sent it out in the belief that it was absolutely identical with the first, but in full-

grown plants the points of divergence noted above are easily recognisable.

The third form we must distinguish as—

***P. excelsa* Gregoriana forma Parsonsii.**

This form was distributed from the S. B. Parsons Nursery, Flushing, New York, under the false name of var. *Clanbrasiliana*, to which variety it bears no resemblance. It is obviously a *Gregoriana* form having similar coloured branchlets with slight pubescence on them, similar buds, and similar grey-green foliage, but it differs from the two first forms in—

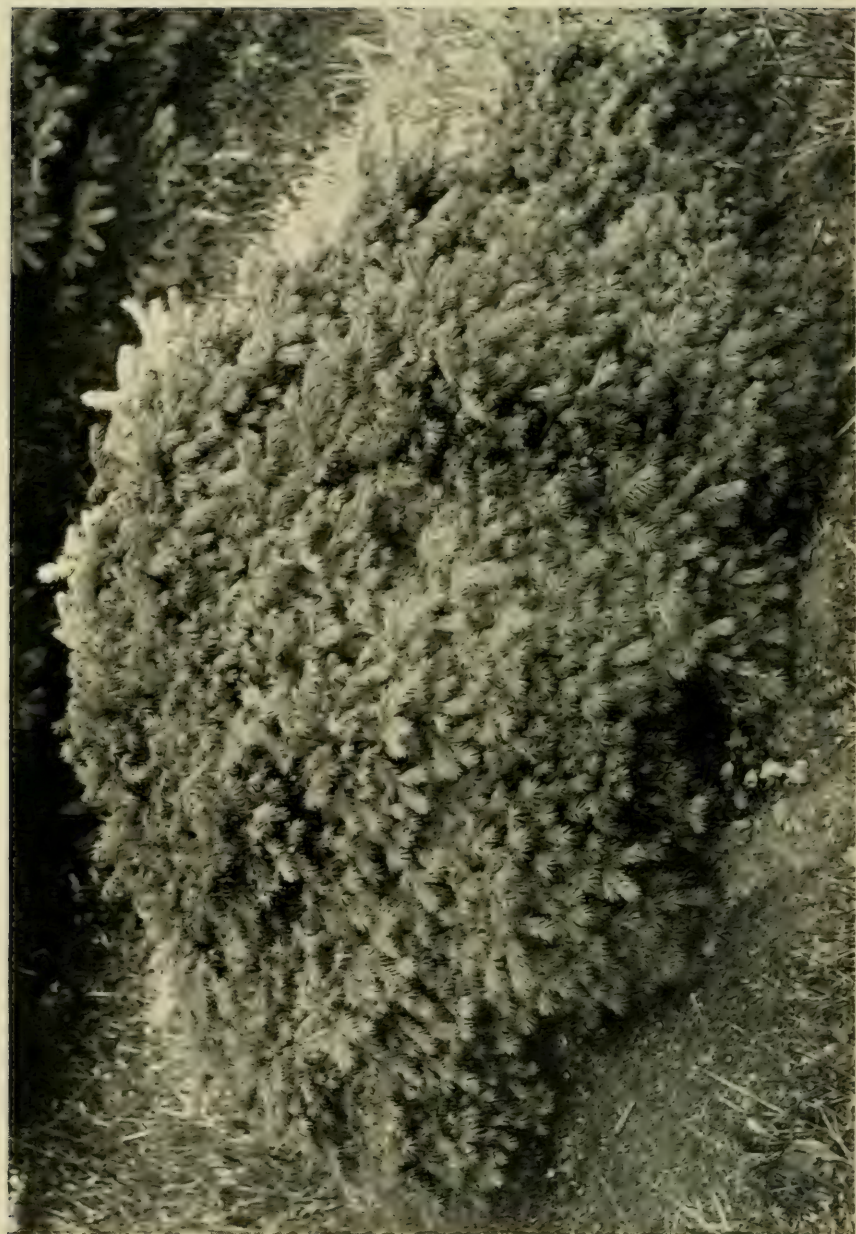
(1) *Habit*.—It makes a much looser straggling bush; its branches are more horizontally spreading and its branchlets are very pendulous.

(2) *Growth*.—Its branches are slightly longer, making an annual growth of from 1 inch to $1\frac{3}{4}$ inches, and its leaves are longer, flatter, and set wider apart on the branchlets. In this form the round needle-shaped leaves are absent, and the leaves are never perfectly radial; in most cases they are arranged pectinately. There are plants of this form at the Arnold Arboretum and at Highlands Park, Rochester, New York. In the latter it has formed a low loose and slightly domed cushion under 3 feet high by over 5 feet through. It is probably to be found elsewhere in America, but I have only once come across it in European cultivation. From the photograph of the Highlands Park plant it appears to be quite distinct.

There is yet another form in Rochester, N.Y., which differs in some respects from this, but in the absence of definite information I hesitate to separate it from the others. Its growth is nearly twice as vigorous as that of No. 2; its branchlets are red-brown, not grey-brown, and its pubescence is more marked, more widely scattered, and softer; its buds are the same. At first sight it looks simply like a rank-growing form No. 2, but in some respects it seems nearer to *P. rubra* than to *P. excelsa*.



PICEA EXCELSA, VAR. GREGORIANA (VEITCH'S FORM), AT HIGHLANDS PARK, ROCHESTER, N.Y.



PICEA EXCELSA, VAR. GREGORIANA (PARSONS' FORM), AT HIGHLANDS PARK, ROCHESTER, N.Y.

Mr. Dunbar informs me that it is very irregular in growth, some of its branches protruding from the sides of the bush. It is a curious form upon which I cannot at present give a decided opinion. It is probable that these four forms were propagated from four different "mother plants."

P. excelsa, var. humilis, Beiss. (i. 364).

Buds.—Minute, globose, flattened apex, light brown, surrounded by a ring of darker brown outer scales. Terminal buds in ones or twos.

Branches.—Crowded and spreading.

Branchlets.—Minute, densely crowded and ascending; shining white; very fine; annual growth $\frac{1}{4}$ to $\frac{1}{2}$ inch.

Leaves.—Radial, very small— $\frac{1}{8}$ to $\frac{3}{8}$ inch; dark glaucous bright green, some slightly twisted, others slightly recurved; all pointing forward and out, uniform, round rather than flat, barely tapering from lower third to apex; two to three stomatic lines on each side.

Not unlike var. *Gregoriana*, only still smaller; and leaves dark green, forming a thick cushion, very slow-growing. An old plant at Kew has formed a round close cushion 2 feet 6 inches by 2 feet 6 inches.

P. excelsa, var. pygmæa, Carr. ("Conif.," 1st ed., 250, 1855).

Syn.: *Abies excelsa pygmæa*, Loud.

A. parvula, Knight.

A. miniata, Hort.

A. nana in Hort. Soc.'s Gardens.

A. elegans of Smith's Nursery ex Loud. (2295; 1837).

Buds.—Very small, conical, obtuse, dark brown. Terminal buds borne singly or in crowded groups.

Branches and Branchlets.—Mostly very small, dense and irregular. Occasional larger branches and branchlets protrude bearing proportionately larger buds and leaves. Branchlets, annual growth $\frac{1}{8}$ to $\frac{1}{2}$ inch, glabrous shining white, mostly ascending.

Leaves.—Short—under $\frac{1}{4}$ inch, radial, pointing out and slightly forward, yellow or dark green; rather stumpier, thicker, and less tapering than those of var. *humilis*, and abruptly slanting from under side at apex. Two to three stomatic lines on each side.

This is one of the smallest and densest forms of *P. excelsa*. Extremely slow-growing, it makes a fairly compact conical, erect little bush, with very short and numerous irregular branchlets. At Kew the best specimen is a compact but irregular little bush, 3 feet by $2\frac{1}{2}$ feet. My best specimen is $2\frac{1}{2}$ feet by 21 inches.

Var. *globosa nana* of the trade seems very near to this, at most only a sub-variety of it; in habit it is not globose, but broadly pyramidal; its branchlets and leaves are generally stouter and more frequently abnormal; extra stout branchlets protrude from the sides and top of the plant here and there in a similar manner to those of var. *nana*, and it grows quicker and attains a greater height.

This is probably the form described by Gordon ("Pinetum," 7, 1875) as var. *pygmæa* and growing "only a foot high but spreading on the ground"; and by Beissner (ii. 235) as var. *Merkii*, as being similar to var. *nana* but growing "outwards rather than upwards into a wider cone." The true var. *Merkii* (q.v.) is in reality not very close to var. *nana*. There is no authority for the name of var. *globosa nana*, and this var. *pygmæa* form bears no resemblance to var. *globosa*, Berg. There is a plant of the *globosa nana* form at Kew, 4 feet by 4 feet; another in Mr. Pack-Beresford's rock garden at Fenagh, Co. Carlow, which, planted in 1897 when 1 foot by 15 inches, has grown in twenty-four years to a roundish bush 4 feet by 3 feet 9 inches.

Of var. *pygmæa* (type) the oldest specimens I know are in the rock garden at Leonardslee. Their history is given as follows: Grown in Osborn's Nursery eighty years, then in Veitch's Nursery ten years, then purchased by the late Sir Edmund Loder and grown by him for forty-one years. Age in 1920, 131 years. Six or more plants

narrowly conical. Largest specimen, 4 feet 6 inches by 2 feet 6 inches. Owing to the fact that the lower branches on all these specimens have been cut away to show the trunk, the dimensions through them are smaller than one would expect in plants of this age and height

The first mention of var. *pygmæa*, is Loudon's description of it in 1837, when the Leonardslee specimens would be already over forty-five years old. He describes it as a form only recently seen in London, having been planted in the Horticultural Society's Gardens in 1835, and in 1837 being 6 inches high. It is possible that the age of the Leonardslee specimens when Veitch bought them from Osborn's was over-stated, as, if true, it would make this form as old, or older than, the original var. *Clanbrasiliana* (a plant of which had been growing in London for over thirty years when Loudon described it and var. *pygmæa*). But even if we do not accept their age as stated, we may very fairly assume that they must be very early propagations of probably the original "mother plant" of this variety, and they are as interesting in their way as is the plant of var. *Clanbrasiliana* at Tullymore Park, which is stated to be either the original mother plant or the earliest propagation existent of that variety.

P. excelsa, var. *nidiformis*, Beiss. (ii. 235 and 630).

Buds.—Small—about $\frac{1}{8}$ inch, conical, acute, dark brown.

Branches.—Very crowded and ascending.

Branchlets.—Annual growth $\frac{3}{4}$ inch to $1\frac{1}{4}$ inches. Light whitey-brown; very densely crowded, spreading, and very fine, all pointing forward at an acute angle and upward. Tips sometimes decurving.

Leaves.—Pectinate, branchlets bare below; lower ranks point out at right angles or slightly forward, above (few), pointing forward and slightly up. Very flat, thin, narrow, dark green; slightly curved; about $\frac{3}{8}$ inch long; apex abruptly tapering to a slightly incurved cartilaginous point. About two to three stomatic lines on each side.

An extraordinary dense form, so densely branched that one wonders how the light ever gets to the lower branches. Branchlets in tight layers, the whole forming a dense head like an inverted cone. Beissner states that it was found in cultivation by Rulemann Grisson at Saselheide, near Hamburg, and described it in 1906 as "a round plate-like, fan-forming form with a dense nest-like mass of branchlets where the leading shoot should be." And later in Appendix (p. 630) he states that two almost similar plants were found wild at Friedrichshafen, $1\frac{1}{2}$ metres through—a multitude of dense fine branches forming a "horn" (*forma convoluta*). My best specimen is about 1 foot high by about 2 feet 6 inches through the head.

***P. excelsa*, var. *pachyphylla*.**

Syn.: var. *echinæformis*, Kew (not Beiss. or Hort);
var. *ferox*, Hort aliq.

Buds.—Globose or ovate; large and fat, $\frac{3}{16}$ inch, and as wide as high. Crimson-brown; resinous; some borne singly as terminal buds, sometimes in twos, rarely in threes or more. Some branchlets end "blind," producing either a tuft of leaves alone, or a tuft of leaves with a minute bud at one side.

Branchlets.—Annual growth 1 inch to $1\frac{1}{2}$ inches; very short, thick, and stout; shining orange-brown.

Leaves.—About $\frac{5}{8}$ inch, very dark shining green, mostly radial, appearing closer set than they are in reality owing to their disproportionate thickness and size. Very thick, nearly $\frac{1}{12}$ inch in diameter, two round and two flat surfaces with eight to ten stomatic lines on each. Leaves all point forward at a very acute angle—almost appressed—and are slightly falcate, fairly uniform in width with abrupt very blunt apex.

This is one of the most distinct forms produced by *P. excelsa*. There is a plant of it at Kew—a low loose irregular bush 2 feet by $1\frac{1}{2}$ feet, about fifteen years planted. Origin unknown. I have only small plants of it.



PICEA EXCELSA, VAR. PYGMEA, ON A ROCK-CLIFF AT
LEONARDSLEE, SUSSEX.

(Over 100 years old.)



PICEA EXCELSA, VAR. MAXWELLI, AT THE OLD MAXWELL NURSERIES, GENEVA, N. Y.

P. excelsa, var. *conica*, Carr. ("Conif.," 2nd ed., 332).

Syn.: var. *stricta*, Gord. ("Pinetum," Sup. 5)
(not Hort).

Buds.— $\frac{1}{8}$ to $\frac{1}{4}$ inch; light brown.

Branches and Branchlets.—Ascending at a narrow angle. Branchlets thin and very crowded; annual growth $1\frac{1}{2}$ to $2\frac{1}{2}$ inches; white-brown to darker.

Leaves.—Radial, thickly and evenly set all around the branchlets and set almost at right angles; small, $\frac{1}{8}$ to $\frac{1}{4}$ inch. Soft, thin, slightly curved, widest at lower third, tapering to abrupt point; light bright green.

A compact conical shrub, of fairly vigorous growth. There are fine specimens of this and the following variety in the Rock Garden at Curragh Grange, Co. Kildare. The specimen of this variety is now 5 feet high and about the same in diameter.

P. excelsa, var. *elegans*, Hort.

Syn.: var. *conica elegans*.

Very similar to var. *conica*, but rather stronger-growing; branches not ascending at quite so narrow an angle, and their tips inclined to "dip"; foliage slightly stouter, but probably not quite so radially arranged, but the whole effect is lighter—a more graceful and elegant shrub than var. *conica*, and lacking somewhat of its severity of outline. The specimen at Curragh Grange is 3 feet 6 inches by 2 feet in diameter.

P. excelsa, var. *Maxwelli* of Maxwell (not Beiss. or Hort).

Buds.—Stout, ovoid, but rather stumpy, dark brown with lighter centres; bud scales appressed; tips rounded.

Branches.—Short and stiff.

Branchlets.—Annual growth $\frac{3}{4}$ to 1 inch; mostly ascending; short and thick; white or yellow-brown.

Leaves.— $\frac{1}{5}$ to $\frac{1}{2}$ inch. On upright branchlets—radial and pointing out and slightly forward; set rather far apart.

On lower branchlets—imperfectly radial, those above pointing directly forward. Roundish; stout and stiff; slightly curved, narrower at upper third; tapering abruptly and ending in a rather long and very fine hair-like point which is sometimes hooked; bright green, with about three stomatic lines on each side.

A very distinct form raised about forty years ago in the Maxwell Nurseries at Geneva, New York, where plants of it are still to be found in the now disused nursery grounds; also in neighbouring gardens; in the Arnold Arboretum, and at Highlands Park, Rochester, N.Y. It makes a low rounded cushion, the top of which is a mass of stout, very short branchlets with thick radial leaves, and when once seen this form is easily recognised. The old plants at Rochester and Geneva are now about 2 feet high by 4 feet through.

The true plant is very rare, and so far I have not met it in cultivation in Europe, it being represented, as a rule, by a form of much looser and more open growth, with different leaf arrangement, buds, etc., for which see var. *pseudo-Maxwelli*. The plant which Beissner describes under this name as having "remarkable brown branchlets, monstrous tufted side branchlets and stiff sharp prickly radial leaves like those of *Picea polita*," is a Continental form that I have only just acquired. It has the dark mahogany brown branchlets and thick pointed leaves of var. *Barryi* (true) and the appearance of var. *nana* (Carr.), but is lower and flatter in shape. It was sent to me as var. *echinæformis* (which it is not), and the nurseryman who supplied it knows nothing of its history, and so far I have been unable to trace it; and in the absence of definite information as to its habit and ultimate height, etc. (mine is only a small grafted plant), it must remain for the present as var. *Maxwelli* of Beissner.

P. excelsa, var. **pseudo-Maxwelli**.

Syn.: var. *Maxwelli*, Hort (not Maxwell or Beissner);
var. *mucronata*, Hort.

Buds.—Conical, acute, light brown. Terminal bud almost concealed by uppermost ranks of leaves.

Branches.—Close-growing—in almost horizontal planes.

Branchlets.—Slightly ascending; annual growth $\frac{1}{2}$ inch to $1\frac{3}{4}$ inches; stout; light orange-brown.

Leaves.—Yellow-green or green; mostly radial; very crowded on upper side and at tips of branchlets; bases of leaves somewhat appressed to branchlet; tips of leaves usually recurving, tapering from middle to acute apex with either a sharp point or with the long hair-like point of var. *Maxwelli*. Leaves about $\frac{3}{16}$ to $\frac{3}{8}$ inch, rather flat than round; about three stomatic lines on each side.

At first a low round cushion-like plant, developing with age into a round or beehive-shaped bush with branches in almost horizontal layers. In its young state it is not unlike var. *Maxwelli*, but differs in shape of buds and size and shape of leaves. This is frequently received from French nurseries as var. *mucronata*, and from Dutch and German nurseries as many other varieties.

P. excelsa, var. **capitata**, Croux (*Revue Horticulturale*, 1889, p. 393).

Syn.: var. *dumosa* of Kew (not Carr. and Beissner).

Buds.—Broadly conical, obtuse; about $\frac{1}{4}$ inch; brown; non-resinous. Bud scales large and all ciliate at edge, the lower scales being darker than those on apex. Terminal bud completely covered by uppermost ranks of leaves, which in some cases apparently grow up the sides of the bud.

Branches.—Thick, flexible, ascending, pale yellow; glabrous. Branchlets irregular in size, but almost uniform in thickness, mostly growing in crowded tufts or heads at ends of secondary branches. Very crowded and narrowly ascending. Annual growth $\frac{1}{4}$ inch to $2\frac{1}{2}$ inches. Shiny

white-yellow; pulvini very strongly marked; branchlets covered by appressed leaves set rather distantly apart.

Leaves.—Radial; pointing forward, incurved and almost appressed to branchlets from base to apex; very thick and wide, tapering from wide base to narrow acute but not prickly apex; outer side strongly keeled and slightly convex, $\frac{3}{8}$ to $\frac{1}{2}$ inch; shining yellow-green; about three to five stomatic lines on upper and seven to eight on lower sides.

A most distinct form of uncertain origin, the plant at Kew forming an irregular pyramid 4 feet by 3 feet; it has no relation to Carrière's and Beissner's "*dumosa*"—a variety of var. *procumbens*—and I suggest that this is probably var. *capitata*, Croux, which is thus described: "A form brought into cultivation by Croux at Sceaux, France, sending out branches like a bush in all directions. At the end of the branches short shoots stand very close together forming heads." This description is not sufficiently clear to enable one to determine the matter absolutely, but having regard to the manner in which the branchlets grow in crowded tufts at the end of the branches, the name "*capitata*" seems far more suitable for this form than "*dumosa*." No other form that I have found in cultivation comes anywhere near to this description of Croux's form.

P. excelsa, var. Ellwangeriana, Hort.

Buds.—Conical, acute, orange-red, about $\frac{1}{4}$ inch, uppermost ranks of leaves growing out of and nearly concealing them.

Branchlets.—Stout, stiff, bright orange; pulvini strongly marked, crowded and fan-forming. Annual growth $1\frac{1}{2}$ to 2 inches.

Leaves.—Arranged pectinately, branchlets bare below; lower ranks of leaves fairly wide apart; on some, branchlets pointing nearly at right angles; on others, forward. Those above, fewer and pointing forward or across. About $\frac{3}{4}$ inch long; bright dark green, slightly curving to both ends;

stiff, fairly stout; gradually tapering to a fairly long, sharp point; four to five stomatic lines on each side.

A pyramidal or roundish bush of vigorous growth and somewhat loose habit, and inclined, with age, to revert to normal arborescent type. It is not common in cultivation in Europe, having been raised in U.S.A. about forty years ago. Plants grown under this name in European gardens are rarely true. The above description was taken from an old tree in Highlands Park, Rochester, N.Y., which has made a beehive-shaped bush 3 feet by $2\frac{1}{2}$ feet.

P. excelsa, var. **Remonti**, Hort (not Kent).

Buds.—Conical, acute, about $\frac{1}{4}$ inch; light yellow-brown; non-resinous.

Branches and Branchlets.—Ascending at a narrow angle. Branchlets, annual growth $\frac{1}{2}$ to 1 inch; shining light yellow; fine, fairly stiff; very numerous; pulvini disproportionately large.

Leaves.— $\frac{1}{4}$ to $\frac{3}{8}$ inch; very fine and soft; pale yellow-green; practically radial. Pointing either at right angles to branchlets or upward; tapering from middle to slender pointed apex, and set rather far apart.

A very distinct, regular, ovoid, conical, or globose form of extremely slow growth. A plant at Kew has made a conical tree 3 feet by $2\frac{1}{2}$ feet. It is quite a distinct variety, and once recognised cannot be confused with any other.

There are at least two forms of this variety in cultivation, differing very little except in the length of their leaves; in one form, the leaves on every branchlet gradually decrease in length from base of branchlet to terminal buds, each branchlet forming a little pyramid of foliage.

The form described by Kent (Veitch's "Man. Conif.," 1900), which he considers to be the dwarf form of var. *eremita*, is a Continental form of uncertain origin. Much stronger in growth than var. *Remonti* and soon making quite a large narrowly conical shrub. It is near to var. *conica*.

P. excelsa, var. echinæformis, Beiss. (i. 344).

Buds.—Small, cylindrical, with round apex; pale brown with outer scales dark brown; non-resinous.

Branchlets.—Annual growth 1 inch to $1\frac{1}{2}$ inches; crowded; glabrous; pale brown; slightly ascending.

Leaves.—About $\frac{3}{4}$ inch, few and radial; at right angles or pointing slightly forward, and set far apart. Uniform, round, and reed-like. Thin and stiff; about $\frac{3}{4}$ inch; tapering to narrow stiff point; pale yellow-green; about three stomatic lines on each side.

A very dwarf, slow-growing, absolutely distinct form; it has made with me a low humped rather flat-topped cushion 9 by 21 inches; its shape and rather long prickly leaves cause it to resemble a hedgehog.

P. excelsa, var. hystrix.

Syn.: var. *echinæformis*, Hort aliq. (not Kew or Beiss.).

Buds.—Minute, globose; dark brown with lighter centres.

Branchlets.—Short and rather stout, but flexible; light brown; annual growth $\frac{1}{2}$ to $\frac{3}{4}$ inch; pulvini exceptionally strongly marked.

Leaves.—Arranged radially, and very crowded and overlapping, almost completely covering the branchlets, on which, owing to the open growth of the plant, they are retained for several seasons. The leaves point forward, their bases and lower third being almost appressed to the branchlet. They then gradually curve out, their tips being at an angle of about 45 degrees to the branchlet. Leaves thin but stiff, sharply four-sided, their outer side being marked with an unusually deep keel, tapering gradually to a long and very sharp point; about two to three stomatic lines on each side.

The above description refers to a small, slow-growing plant of open and rather straggly growth, that I received under the name of var. *echinæformis* from Germany; it is extremely slow in growth, and the manner in which the

stiff sharp-pointed leaves are appressed to the branchlet reminds one of the arrangement of a porcupine's quills. It is quite distinct from var. *echinæformis*.

P. excelsa, var. **Merkii**, Beiss. (Jaeger and Beiss., "Ziergehölze," 440, 1884).

Buds.—About $\frac{1}{16}$ to $\frac{1}{8}$ inch, conical, light brown; bud scales rather loose.

Branches.—Spreading, slightly ascending, tips pendulous.

Branchlets.—Very irregular in size and quantity; annual growth $\frac{1}{4}$ to 1 inch; yellow-white; mostly very fine and flexible.

Leaves.—Semi-radial or pectinate, branchlets nearly bare beneath, completely covered on top. Leaves about $\frac{1}{2}$ inch, straight, very thin, narrow and flat, gradually tapering to a long hair-like point. Those on top pointing directly forward and appressed; those at sides at angle of 45 degrees, but at the base of each side bud a single leaf sticks out at right angles. Colour shining grass-green. One to three stomatic lines on each of its four sides.

A compact, short-branched, roundish, rather low-growing form, growing outwards rather than upwards but forming eventually a low, broad pyramid.

P. excelsa—*Pendulous Forms*.

Beissner (ii. 229) enumerates five pendulous varieties of *P. excelsa*—namely:

(1) Var. *pendula*, Jacques ("Man. des Plantes," 1857).
Syn.: *Abies excelsa pendula*, Loud.

(2) Var. *inverta*, Gordon ("Pinetum," Sup. 4).

(3) Var. *reflexa*, Carr. (*Revue Horticulturale*, 1890).
Syn.: *Abies excelsa pendula*, Croux.

(4) Var. *pendula major*, Hort.

(5) Var. *pendula monstrosa*, Hort.

Of these, Nos. 4 and 5 I cannot trace in cultivation, and Beissner does not state where he saw them; their names sufficiently describe them.

Nos. 1 and 2 are very similar. Beissner describes them as having a more or less erect leader with pendulous branches (in some cases the branches hang almost straight down, as if they were clinging to the main stem). Beissner records many specimens having slight variations, but in Nos. 1 and 2, at any rate, the tendency is for the trees to form upright leaders, and he mentions specimens of nearly 60 feet in height.

As regards No. 3, Beissner distinguishes it from the others as a low pendulous bush, but the matter is not quite clear. The owner of one well-known nursery that specialises in dwarf conifers informs me that he has imported many of these forms from various sources, and he finds them all liable to (a) throw up a leader and grow as Nos. 1 or 2, or (b) "knuckle over" and form a pendulous bush as No. 3. He states that plants from the same consignment may grow on in either of these ways. I grow both forms; I have not yet propagated the upright form, but I have young plants of No. 3 which so far show no signs of throwing up a leader. Form No. 3 is one of the most effective of all conifers for high rocks. My old plant started to throw up a leader, but about 8 inches from the ground it suddenly "knuckled over" like a bent finger with the knuckle on top, and from the end of the "finger" a wide mat of branches and branchlets has flowed down the side of one big rock, run along the ground, and is now going down the face of another rock. The growth is almost as strong and vigorous as that of the normal *P. excelsa*. Foliage very deep green and branchlets red-yellow. This No. 3 form is labelled "var. *reflexa*."

In any case, from the number of old specimens of Nos. 1 and 2 recorded by Beissner, it would seem clear that, once having thrown up a leader, the upright form maintains the character of an arborescent tree, and as such is unsuitable for retention amongst dwarf conifers. On the whole I am inclined to retain two names, retaining the oldest name, var. *pendula*, for Nos. 1 and 2, and var. *reflexa* for No. 3.

P. excelsa, var. *procumbens*, Carr. ("Conif.," ii. 333).

Syn.: var. *prostrata*, Schneider ("Silvo Taur. Friel.-Nadelh.," 230, 1913).

Abies excelsa procumbens, Hort.

A. excelsa expansa, Hort.

Buds.—Small, conical, acute, dark brown.

Branchlets.—Annual growth $1\frac{1}{2}$ to $2\frac{1}{2}$ inches; light yellow; not very stout but stiff; branches and branchlets in flat layers and all pointing forward.

Leaves.—Arranged pectinately; branchlets bare below; side ranks point out and slightly forward, upper leaves very crowded and pointing directly forward. Leaves thin and flat; yellow-green; tips sometimes slightly incurved. Leaves vary in length from $\frac{1}{4}$ to $\frac{1}{2}$ inch, the shortest being at the base and bud ends of branchlet, and the longest in the middle of branchlet.

A low bushy plant with branches spreading horizontally over the ground. A good specimen of this variety in the Arnold Arboretum measures about 18 inches high by about 4 feet across.

A second form of this variety is in cultivation, differing very slightly from the above; its habit is rather more vigorous, and its leaves and branchlets all point forward at a very acute angle.

P. excelsa, var. *dumosa*, Carr. ("Conif.," ii. 332) and Beissner (not Kew).

Is said to be like var. *procumbens*, a bushy tufted shrub with branches spreading almost horizontally over the ground; numerous thin, woody branchlets and short straight-pointed leaves placed far apart. I have never seen it in cultivation.

P. excelsa, var. *repens*, Simon-Louis ("Mitt. d. d. d. Ges.," 1888, p. 85).

Buds.—Minute, ovoid, pale yellow.

Branches.—Either flat on the ground or slightly ascending and arching at the tips.

Branchlets.—Very fine and flexible white-yellow to brown; annual growth about 1 inch; pendulous.

Leaves.—Mostly arranged radially and very crowded; those below mostly pointing forward; those at sides and above pointing out and forward; very fine, thin and straight, tapering gradually from base to tip; about three stomatic lines on each side.

A small low bush of irregular growth; some branches flat on the ground, others rising slightly and then decurving.

P. excelsa, var. *prostrata* (not Schneider).

Buds.—Globose; light brown; borne in irregular clumps both on ends and sides of branchlets, and varying in size.

Branchlets.—Light orange; stout but very flexible. Annual growth from $\frac{1}{2}$ inch to 3 inches, stoutness of branchlets varying in proportion to their length. Branchlets in irregular whorls and very crowded into flattened, almost horizontal planes.

Leaves.—Irregular in size, shape, and direction, from $\frac{3}{16}$ inch and thin to $\frac{3}{4}$ inch and thick, roundish, with about four stomatic lines on each side.

An absolutely prostrate form of which I have only a small plant, which I obtained from Hillier's Nursery at Winchester. I do not know its origin. It came to me as var. *procumbens*, but it is not var. *procumbens*, Carr.

P. excelsa, var. *tabuliformis*, Carr. ("Product. des Variétés," 52).

Buds.—Small— $\frac{1}{12}$ inch; yellow-brown.

Branches.—Slightly decurving and almost prostrate.

Branchlets.—Very thin and flexible, pointing forward at angle of about 40 degrees, flat and all in one horizontal plane; yellow-brown, becoming grey-brown. Sparse, not crowded.

Leaves.—Pectinately arranged; bottoms of branchlet bare; lower leaves pointing out and slightly forward;

those above pointing slightly up and directly forward; very thin, flat, pale yellow-green; from $\frac{1}{4}$ to under $\frac{1}{2}$ inch; flexible, blunt apex.

A prostrate form with slender branches spreading horizontally over the ground, said by Carrière to have originated from a cutting taken from a "witches'-broom" growing on a normal tree in the Trianon. Elwes and Henry (vi. 1343) state that Torssander found a similar plant growing in Södermanland, Sweden, thirty years old and 20 inches high.

The best specimen I have seen is growing in the Rock Gardens at Fenagh, Co. Carlow; age unknown, but planted over twenty years; size 17 inches high and 4 feet in diameter.

P. excelsa, var. pyramidalis gracilis, Beiss.

Syn.: var. *Clanbrasiliana*, Hort. aliq. (not Carr.);
var. *Gregoriana*, Hort. aliq;
and many others.

Buds.—Large, conical, scarious, bright red-brown, $\frac{1}{4}$ to $\frac{5}{16}$ inch.

Branchlets.—Annual growth 2 to 3 inches; orange-red; stout, about $\frac{1}{8}$ inch thick.

Branches and Branchlets.—Ascending.

Leaves.—Arranged pectinately to nearly radial; all point outwards and forwards; bright or dark green; stout, slightly falcate, about $\frac{1}{2}$ inch; round rather than flat; uniform width; tapering from upper fourth to blunt but stiff apex.

A rather strong-growing regular-shaped pyramid, stiff and stout, which is grown in quantity in Continental and British nurseries and supplied under many names, the rarest being its own. "When in doubt send *pyramidalis*," seems to be the rule. The only point of resemblance it has to the slow-growing var. *Clanbrasiliana* is its bright red buds. I do not know the ultimate height of this form; most people will find it too big in time for ordinary rock

gardens. It is a handsome plant that one would welcome if one did not see it so often and receive it under so many names! The above name applies only to the slower-growing compact pyramidal form of this variety. From Beissner's descriptions vars. *archangelica* and *mucronata* must be very close to this.

P. excelsa, var. **mucronata**, Carr. ("Conif.," 2nd ed., 247, 1867).

Syn.: *Abies excelsa mucronata*, Loud. ("Ency. of Trees," 1027; 1842).

A. mucronata, Rauch. ex Gord. ("Pinetum," ii. 9).

This is one of the oldest forms in cultivation, but its identity is not clear. The form most frequently found in commerce or cultivation under this name is the false var. *Maxwelli* (*q.v.*, and also var. *microsperma*), but in several particulars the *Maxwelli* form does not coincide with the recorded descriptions of var. *mucronata*; it is one of the strong-growing Continental forms referred to under var. *pyramidalis gracilis*, which comes nearest to the recorded descriptions.

Carrière's description of it is: "A shrub, bushy and diffuse. Branches few, spreading or decurved. Branchlets stout and short, covered with reddish bark. Leaves distant, spreading, relatively short and stout; straight, sometimes radial or slightly recurving; very stiff and ending in a stiff short point. When the plants are vigorous, the branches are more erect. Branchlets are much stouter and their orange-red bark strongly grooved, which gives a great resemblance to var. *eremita*. Raised from seed by M. Briot at the Trianon, where the mother plant, 4 metres high, seems to have reached its maximum."

Gordon ("Pinetum," 2nd ed., 1875) ex Loudon describes var. *mucronata* as having "short dark green sharp-pointed leaves and distorted irregular branches, rather crowded."

Beissner (ii. 237) describes it as a luxuriant form of upright growth with ascending branches, red-yellow bark and some monstrous branchlets, habit resembling var. *eremita*, and thick erect, very stiff, sharp-pointed leaves.

If Carrière's description is correct—and it is so similar to that of Beissner and Gordon that one has no reason to doubt it—the *pseudo-Maxwelli* form referred to above cannot possibly be var. *mucronata*, as it differs from the description of the latter variety in habit, growth, and colour of leaves and branchlets, and the only form which approaches the description is a form very close to var. *pyramidalis gracilis*, but of stronger, stouter growth, and forming a wider pyramid.

This form is constantly exported from Dutch and French nurseries as vars. "*Gregoriana*, *Clanbrasiliana*, *pygmæa*," etc., and is met with in cultivation under these and several other names, and it may be thus described:

Buds.—From $\frac{3}{16}$ to $\frac{5}{16}$ inch; conical, acute, red-yellow.

Branchlets.—Annual growth 1 inch to $2\frac{1}{4}$ inches; stout and stiff; the larger branchlets being unusually thick, often growing erect at the ends of ascending branches (in which case having leaves arranged radially); bright red-yellow, pulvini very strongly marked. Branchlets very crowded, fan-forming and cupped, and pointing forward and up, or directly up.

Leaves.—Dark shining green; stiff, stout, and sharp-pointed; very crowded on branchlets and imperfectly radial or pectinate; those below point out and slightly forward, those above very crowded and point forward; almost uniform in width; strongly keeled; slightly curved, apex tapering abruptly. Size varying with strength of shoot from $\frac{1}{4}$ to $\frac{3}{4}$ inch. About three stomatic lines on each side.

A strong-growing wide pyramidal shrub with ascending branches and branchlets; occasional branchlets being unusually strong and stout.

The other form found in cultivation as var. *mucronata* is described under var. *pseudo-Maxwelli* (q.v.).

P. excelsa, var. decumbens.

Syn.: var. *dumosa*, Hort (not Kew or Carr.).

Buds.—Narrowly conical, about $\frac{3}{16}$ inch; red-brown.

Branches.—Point upwards and then arch; with their points splayed out. In effect a branch and its branchlets looks not unlike a rhubarb leaf with its base and edges almost touching the ground.

Branchlets.—Stiff; light orange; decurving; annual growth $1\frac{1}{2}$ to 2 inches.

Leaves.—Arranged pectinately; very crowded above; those below point out and forward at angle of 45 degrees; those above, slightly up and directly forward; flat, stiff, linear; from $\frac{1}{4}$ to $\frac{1}{2}$ inch; very dark green; abrupt apex.

This is a form closely akin to vars. *mucronata* and *pyramidalis gracilis* (q.v.), differing chiefly in habit.

P. excelsa, var. microsperma, Masters (Kew Hand-list, "Conif.," 67, 1896, name only).

Buds.—Conical; $\frac{1}{8}$ to $\frac{3}{16}$ inch; acute; bright red-brown; bud scales rather loose.

Branches.—Stiff and ascending.

Branchlets.—Annual growth 1 to 2 inches; grey-brown; stiff; pulvini slightly darker.

Leaves.—Arranged pectinately or semi-radially, close-set and all pointing forward; those below at angle of about 45 degrees, those above nearly directly forward; about $\frac{1}{2}$ inch long; thick, stiff and rather flat; slightly incurved, widest at middle, and tapering to blunt cartilaginous point; light bright green.

A dense, compact round or conical bush; branches and branchlets very crowded and ascending; a distinct form of uncertain origin and fairly vigorous growth.

I can find no authority for this name, although there are many forms in commerce under it; the most usual form is a broad pyramidal bush very similar to var. *pyramidalis*



PICEA EXCELSA, VAR. MICROSPERMA, AT THE ARNOLD ARBORETUM.



PICEA EXCELSA, VAR. NANA, AT KNAPTON.

gracilis, but looser and not quite so stiff. Another form differs from that described above only in the colour of its branchlets, which are orange, and its shape, which is a broad rather flat-topped bush.

P. excelsa, var. *nana*, Carr. ("Conif.," 2nd ed., 332); Beiss. (ii. 235).

Syn.: var. *brevifolia*, Cripps (Beiss., not Gord.).

Buds.—Variable in size; round, flat-topped; orange-brown.

Branches.—Ascending; obliquely spreading.

Branchlets.—Short; annual growth $\frac{1}{2}$ to 1 inch; thick; rigid; bright orange-yellow; pulvini strongly marked. Often swollen or monstrous, rarely fasciated.

Leaves.—Arranged radially and almost appressed; about $\frac{1}{2}$ inch, but varying in size with that of branchlet; thick, widest at lower third; stiff, abruptly tapering to sharp point. Leaves few and set wide apart. Size of branchlets and leaves very irregular, especially on top of the plant, where often abnormally thick branchlets bearing larger and thicker leaves and very stout buds crop out.

A very distinct and abnormal slow-growing form, making a conical or flattened globose bush of very crowded ascending branches and short branchlets. The abnormal branches which appear on the top and occasionally stick out at the sides of the plant are very distinct, and in consequence the form is particularly easy to recognise. Notwithstanding this, it never appears to be sent out under its own name. I have seen and also received it as vars. *Gregoriana*, *pygmæa*, and *elegans*!

Two plants over twenty-five years old at Fenagh, Co. Carlow, now measure 2 feet 7 inches and 2 feet 10 inches respectively by about 2 feet diameter.

Beissner makes var. *brevifolia* (Cripps, not Whitrock) a synonym of this, but from the earlier description of Cripps' var. *brevifolia* in Gordon's "Pinetum" (1875, p. 7) it is quite distinct.

P. excelsa, var. **Ohlendorffii**, Späth (Cat., 1904-5); Beiss. (ii. 234).

Syn.: *P. orientalis pygmæa*, Ohlendorff (in error).

Buds.—Small, conical, acute, about $\frac{1}{8}$ inch, light orange-brown or crimson; non-resinous.

Branches.—Brown; thin, but stiff.

Branchlets.—Crowded, ascending; very stiff, fine and cupping; spreading fan-wise; tips of branchlets drooping; shining white-yellow; pulvini and grooves strongly marked; occasional pubescence in grooves. Annual growth $\frac{3}{4}$ to $1\frac{1}{2}$ inches, thickly covered with leaves.

Leaves.—Arranged pectinately; branchlets bare below; leaves crowded and covering branchlet above. Leaves in lower ranks point slightly forward and downward; those above, almost directly forward and rather appressed. Very flat, thin, narrow, and fine; curving slightly edgeways towards branchlet from upper third to pointed apex. $\frac{3}{8}$ to $\frac{1}{2}$ inch; pale yellow-green.

Beissner (190-234) states that this makes a regular, very compact, globular shrub, with crowded fan-forming branches—an unmistakable *P. excelsa* form wrongly ascribed to *P. orientalis*. A thirty-year-old plant in Späth's Arboretum was 1.70 metres high by as much through. A plant at Kew purchased from Späth in 1910 is now 3 feet by 4 feet.

P. excelsa, var. **Archangelica**, Beiss. (366).

A compact cone with stiff short branchlets and rigid, prickly leaves; apparently no longer in cultivation, unless it is one of the coarse Continental forms described under var. *pyramidalis gracilis* (q.v.).

P. excelsa, var. **pumila**, Beiss.

Buds.—Small—about $\frac{1}{12}$ inch; red-brown.

Branches.—Thick and stiff; red-brown; spreading.

Branchlets.—Annual growth $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, at right angles or pointing slightly forward; fan-shaped and slightly

cupped; close-growing and compact; light yellow to red-brown; branches and branchlets in regular plate-like layers. Young branchlets flexible with slightly drooping tips.

Leaves.—Light shining green, becoming dark lustrous green; arranged pectinately; under side of branchlet bare; lower ranks point out and slightly forward; upper ranks crowded and almost hiding the branchlet, pointing forward and slightly up, thin, flexible, from $\frac{5}{16}$ to $\frac{7}{16}$ inch, tapering from lower third to blunt apex.

There are coloured variations of this known as "*glauca*" and "*nigra*," also a silver variegated plant falsely named "*pumila argentea*" (see var. *brevifolia argentea*).

Plants grown under this name seem to be generally true; in fact, one might almost go as far as to say that it is the only variety that one might safely order from a nurseryman without seeing it first. This plant has been grown for a great many years, and there are some fine specimens of it in cultivation. The best I have seen is an old plant on the west lawn of Abbeylax House, Queen's Co. It has been in its present position for more than seventy years. In a specimen as old as this, the plate-like formation of the branches is very noticeable; it has made a low, round bush—flat-topped except for two or three "humps"; its height is only 4 feet (the humps are 6 inches higher) and its circumference is no less than 75 feet.

This form is very variable in cultivation, there being several varieties of it so close to it as to be almost inseparable; its most distinct variety is grown at Kew under the name of var. *diffusa* (q.v.). Another variety, fairly distinct, is grown in Highlands Park, Rochester, N.Y., as var. 0-1146 *Edson*. The specimen sent to me for examination was very close to var. *pumila*, but from an accompanying photograph it is evident that its habit is much stiffer and compacter, the branches being nearly horizontal and the branchlet tips not pendulous.

P. excelsa, var. diffusa.

Buds.—Very small—under $\frac{1}{8}$ inch; conical, acute; dark crimson-brown.

Branchlets.—Very crowded and overlapping, pointing out and forward at a narrow angle; orange-brown; annual growth $\frac{1}{2}$ to 1 inch; thin and flexible; pulvini and grooves slightly marked.

Leaves.—Pectinate: those below pointing down and slightly forward; those above appressed and pointing directly forward; upper side of branchlets and buds almost concealed by leaves. Leaves soft, thin, flexible; $\frac{1}{4}$ to $\frac{3}{8}$ inch; slightly incurved, uniform, flattish, light yellow-green; tapering slightly to both ends.

A form akin to var. *pumila*, but distinct enough to be separated from it. Grown as var. *diffusa* at Kew, where it has made a dense, close-growing, but widespreading bush, 18 inches by 4 feet.

P. excelsa, var. Sargentii.

Syn.: var. *nana*, Hort. aliq.

Buds.—Small, conical; red-brown, slightly resinous; about $\frac{1}{16}$ inch.

Branchlets.—Fine and very crowded; pointing forward at angle of 45 degrees. Shining pale yellow. Annual growth 1 inch.

Leaves.—Arranged irregularly. Pectinate or radial, in latter case few beneath. All point forward and out at same angle as branchlets. Rather thin, but *round*; small— $\frac{5}{16}$ inch, and uniform; apex abrupt, blunt, and soft. In winter the leaves occasionally become tipped with yellow.

This form was sent to me by Professor C. S. Sargent, and is one of two forms grown at the Arnold Arboretum under the name of var. *nana*. From the specimen branches sent to me, its foliage appears very distinct, and I cannot identify it with the description of any recorded form.

P. excelsa, var. spathulifolia.

Buds.—Rather small; light brown; scarious, conical, acute.

Branchlets.—Pulvini very prominent; light shining orange.

Leaves.—Arranged as in the type or semi-radial, short and thin with large raised keel on upper side and enlarged leaf margins; ridged below. The leaves are narrowest nearest the pulvini and get suddenly flatter and broader near the apex, where the upper ridge disappears and the apex is splayed out in a curious manner; the upper side sloping abruptly, as if sliced on a slant with a knife.

Leaves light yellow-green; those above pointing forward and slightly recurving, those below pointing forward and curving down.

A low-growing form, making a bush considerably wider than high; distinct on account of its unusual spathulate leaves.

A plant of this form at Kew is a low-spreading bush 1 foot 9 inches by 4 feet 6 inches, and is about fifty years planted.

P. excelsa, var. parviformis, Beiss. (ii. 365), is sometimes catalogued, but its name is somewhat deceptive, as its growth is rather strong for inclusion among dwarf conifers. It makes a pyramidal tree with leaves rather shorter and finer than the type.

P. excelsa, var. phyllicoides, Carr. (ii. 333).

A very dwarf, slender shrub. Branches slender, spreading, deflexed. Leaves distant, 4 to 8 cm. long. Stiff, roundish, spreading, thickest in middle, thinnest at both ends; sometimes oblique, ending in a short point.

I have never seen this form, the description is Carrière's.

Beissner records the following forms of *P. excelsa*, which I cannot find in cultivation, and from their short descriptions, several of them do not appear to be very distinct:

P. excelsa, var. **Petröwskoensis**, Beiss. (ii. 232; ex Schröder, "Mitt. d. d. d. Ges.," 1899, 121).

A seedling form raised by Schröder in the Moscow Arboricultural Gardens. A pyramid as broad as high— $2\frac{1}{2}$ metres.

P. excelsa, var. **Shelesnowii**, Beiss. (ii. 232; "Mitt. d. d. d. Ges.," *l.c.*).

Raised by Schröder—a dense, small-growing pyramid.

P. excelsa, var. **compressa**, Schwerin (Beiss., ii. 232; "Mitt. d. d. d. Ges.," 1903, 94).

A plant at Diedorf, not unlike var. *conica*, Carr. A regular conical form with rather short leaves—not very distinct.

P. excelsa, var. **Cellensis**, Schiebler (Beiss., ii. 239; "Mitt. d. d. d. Ges.," 1903, 58).

Raised by Schiebler in Celle, near Hanover. A dwarf, regular, conical form, with fine heath-like branchlets and fine crowded yellow variegated leaves.

P. excelsa, var. **compacta**.

Syn.: *Abies, excelsa compacta*, Booth ("Kirch Arb. Musc.," 695, 1864).

P. excelsa compacta, Sénéclauze ("Conif.," 26, 1868).

The name "*compacta*" covers a considerable group of indistinct forms. In almost every plantation of the type one or two specimens may be found which might be named "*compacta*." Consequently this name has been freely utilised by nurserymen, to distinguish any form for which they can find no other name, and one may expect to receive under it either some well-known form or a shrubby form differing but slightly from the type except in habit. At Kew there are at least half a dozen plants so named, most of them indistinct. In the circumstances it is practically impossible to select any one of them and regard it as a distinct form to the exclusion of the others. Recently a form has been put into cultivation on the Continent

under the name of var. *compacta* *Arselyn*, which is said to be distinct. Of this I have seen only young plants, and at present they appear to be akin to var. *microsperma*, but finer and not so vigorous in habit.

P. nigra, Lk.

Syn.: *P. Mariana*, B.S.P. Prel. and Britt.

The black spruce is found widely distributed in North America, Labrador, Mackenzie River, and Newfoundland, to as far south as Northern Virginia. It produces cones in quite a small state, and the arborescent type varies in height from about 35 feet down to about 2 feet. Professor Sargent ("A. A. Bull.," 18, 1918) states that in the sandy swamps of Prince Edward Island it is not more than 2 feet high, and yet produces fertile seeds and cones. H. E. Ayres (in "Garden and Forest," vii. 504) says that it is found growing in sphagnum on the borders of small forest lakes as little old trees 2 to 3 feet high, their tops densely crowded with cones, and on the highest summits of the Adirondacks, it is a procumbent shrub, offering little impediment to the walker over it; the bushes being quite flat, with their branches issuing from opposite sides of the main trunk and growing in dense patches completely covering the ground.

P. nigra, var. Doumetti, Carr. ("Conif.," i. 242, 1857).

Syn.: *P. Mariana Doumetti*, Hort.

Buds.—Similar to the type, but smaller— $\frac{1}{8}$ to $\frac{1}{4}$ inch.

Branchlets.—Ascending, fine, stiff, bright shining orange, sparsely covered with pubescence; annual growth about 3 inches.

Leaves.—Glaucous, green-blue; almost radial, but fewer below—these point out and slightly forward, a few in the middle rank point out at right angles; those above crowded, somewhat appressed, and point directly forward; under $\frac{1}{2}$ inch; fine, narrow, flexible, straight or curved.

A broad pyramidal shrub with ascending branches. Ultimate height about 7 to 8 feet. This is said (E. and H., vol. vi.) to have been raised in 1835 at Château de Baleine,

Moulins, France. There is a specimen in Glasnevin about 8 feet in height. I have one about 4 feet 6 inches by 3 feet.

P. nigra, var. **ericoides**. Bean ("Trees and Shrubs," i. 160).

Buds.—Minute, ovoid, crimson-brown; terminal bud girt with a ring of almost imperceptible scales from which spring subulate points of varying length.

Branchlets.—Very thin and flexible; pale crimson-brown, covered with not very dense minute pubescence; annual growth 1 inch to $1\frac{1}{2}$ inches.

Leaves.—Arranged as in *P. excelsa*; very thin and heath-like; dark blue-green; $\frac{1}{4}$ to $\frac{2}{8}$ inch; incurved; slightly twisted, with one stomatic line on two sides and three on the other two.

According to Bean, this makes a rounded bush, and has been known in gardens for fifty years, and grows extremely slowly.

P. nigra, var. **pendula variegata**.

Buds, branches, and branchlets similar to the type, but from one-third to one-half smaller.

Branches pendulous. Branchlets drooping.

Leaves about normal in size, but densely crowded, and arranged either radially or semi-radially and mostly pointing directly forward. Colour glaucous blue-green, suffused with gold. Far more attractive than vars. *aurea* or *Finedonensis* of *P. excelsa*.

This form, with me, tends to make a low bush of weeping or pendulous branches. I know nothing of its origin. I bought it from a nursery where it was grown as *P. excelsa*.

P. nigra, var. **fastigiata**, Carr. ("Conif.," ii. 324, 1867).

Syn.: var. *pumila*, Knight ex Gord. ("Pinetum," 8).

P. excelsa, var. *dumettorum*, Hort (in error).

Buds.—Typical, with long subulate points, but black-crimson in colour and resinous; $\frac{1}{16}$ to $\frac{1}{8}$ inch.

Branchlets.—Annual growth 1 inch to 2 inches; very thin and fine; light oak-brown covered with pubescence; all ascending at a very narrow angle to the branches.

Leaves.—As fine as those of var. *ericoides*, but far more crowded; arranged practically radially, but more crowded on outer or upper side. The leaves are much shorter than those of either vars. *ericoides* or *Doumetti*— $\frac{1}{8}$ to $\frac{1}{4}$ inch—and are borne very regularly, incurved and pointing forward at a very acute angle. Glaucous; dark blue-green.

A dwarf columnar form which, according to Gordon, rarely exceeds 4 feet in height. There is an old specimen of this form in the Arnold Arboretum.

These three forms are fairly distinct. Var. *Doumetti* makes a regular open pyramid of fairly vigorous habit. Var. *ericoides* is conical or narrowly pyramidal, of irregular growth; its leaves are heath-like and irregular in arrangement, presenting almost a “furry” appearance. The branches of var. *fastigiata* ascend at a much narrower angle. Its foliage is more radial in arrangement, and its whole appearance is very regular and compact.

P. nigra, var. *nana*, Beiss. (ii. 337).

An ornamental, slow-growing, globose dwarf form, of somewhat lighter blue-green foliage. I cannot trace this form in cultivation, and it is probably only another name for var. *ericoides*.

P. nigra, var. “*Mariana*” of the trade, seems very close to var. *Doumetti*, but makes a rounder bush, and its growth is not quite so vigorous. There is a plant of this form in Glasnevin Botanic Gardens.

P. orientalis, Lk. and Carr.

The Oriental Spruce inhabits the Taurus, Caucasus, and Asia Minor, and was introduced in 1837. It is very hardy, and its soft short lustrous green leaves and compact habit are very distinct.

P. orientalis, var. **nana**, Carr. (*Revue Horticulturale*, 1891, 120).

Syn.: var. *gracilis nana*, Hort.

Buds.—Conical; light brown.

Branchlets.—Annual growth 1 inch to 2 inches; slight pubescence in grooves between the pulvini; white to pale orange; branches ascending; branchlets inclined to “cup.”

Leaves.—Radial, set far apart, pointing out and forward and incurved; thick, round, short, and flexible; very dark green; blunt apex.

A densely branched, fairly free-growing form; very ornamental, making a compact roundly conical bush. I have a specimen about 3 feet 6 inches high and about the same in diameter.

P. orientalis, var. **gracilis**, Beiss. (“Mitt. d. d. d. Ges.,” 1904, 97).

Beissner (ii. 254) states that at a Conifer Conference at Antwerp a pretty dwarf globular form was shown with finer branchlets. I do not know if this form has been propagated, but any plants I have seen under the name of var. *gracilis* in Dutch catalogues are var. *nana*.

P. orientalis, var. **pygmæa glauca**, R. Smith (Cat., 1875).

Was on sale at the nurseries of R. Smith of Worcester, and appears in an old catalogue dated 1875. I cannot trace it further.

A plant under the name of var. *pygmæa* is occasionally met with in English and Continental nurseries which is not a form of *P. orientalis*, but of *P. excelsa* (see *P. excelsa*, var. *Ohlendorffi*).

P. pungens, Engl. (*Gard. Chron.*, 334, 1879).

Syn.: *P. Parryana*, Sargent and Barron (1898).

The blue spruce comes from Colorado and Utah, and was introduced about 1863. The arborescent type is found up to 150 feet in height, but in European cultivation

it is a comparatively small tree. It has both green and glaucous forms, of which the former is the rarer in cultivation. The glaucous forms are extremely handsome, and var. *Kosteri compacta*, although eventually attaining a large size, grows so slowly that it may be grown for a good many years on lawns or in small gardens. Unfortunately old specimens are inclined to lose a good deal of their lower foliage, which rather spoils their appearance. The only form I know which retains its foliage is Sargent's var. *compacta*.

P. pungens, var. **compacta**, Rehder (Barley., "Cyclop. Hort.," v. 2620, 1916).

Buds.—About $\frac{1}{4}$ inch; ovoid; rounded apex; tops of upper scales rounded; some scarious and reflexed, others slightly resinous and appressed. Terminal bud girt with ring of keeled acuminate scales; light brown.

Branches.—Crowded in almost horizontal, plate-like layers.

Branchlets.—Very crowded; spreading; annual growth 1 inch to 3 inches; stiff, stout, glabrous, shiny yellow-brown.

Leaves.—Imperfectly radial; very crowded; thick, rigid, prickly, dark green; $\frac{3}{8}$ to $\frac{5}{8}$ inch long; slightly incurved, with about four stomatic lines on each side. Branchlets retained and not dying away as do those of the type, and all point out and forward.

Raised from seed in the Arnold Arboretum in 1874, where the original plant at thirty-four years of age has made a rather flat-topped, densely branched bush 7 feet high by 12 feet in diameter.

P. pungens, var. **glauca prostrata**, Beiss. (ex "Mitt. d. d. Ges." 1906, 141).

A prostrate form of the type; as glaucous as var. "*Kosteri compacta*" of gardens.

I have seen only young plants, which appear to be of slow growth—one planted over twelve years at Curragh

Grange, Co. Kildare, is a prostrate mat 46 inches in diameter—and differing from var. "*Kosteri*" only in habit.

Beissner (ii. 280) states that this was found in the Botanic Garden at Hamburg.

***P. pungens*, var. *Hunnewelliana*.**

Buds.—About $\frac{3}{16}$ inch; ovoid; white-brown. Scale tips rounded and reflexed. Terminal bud girt with pointed keeled scales.

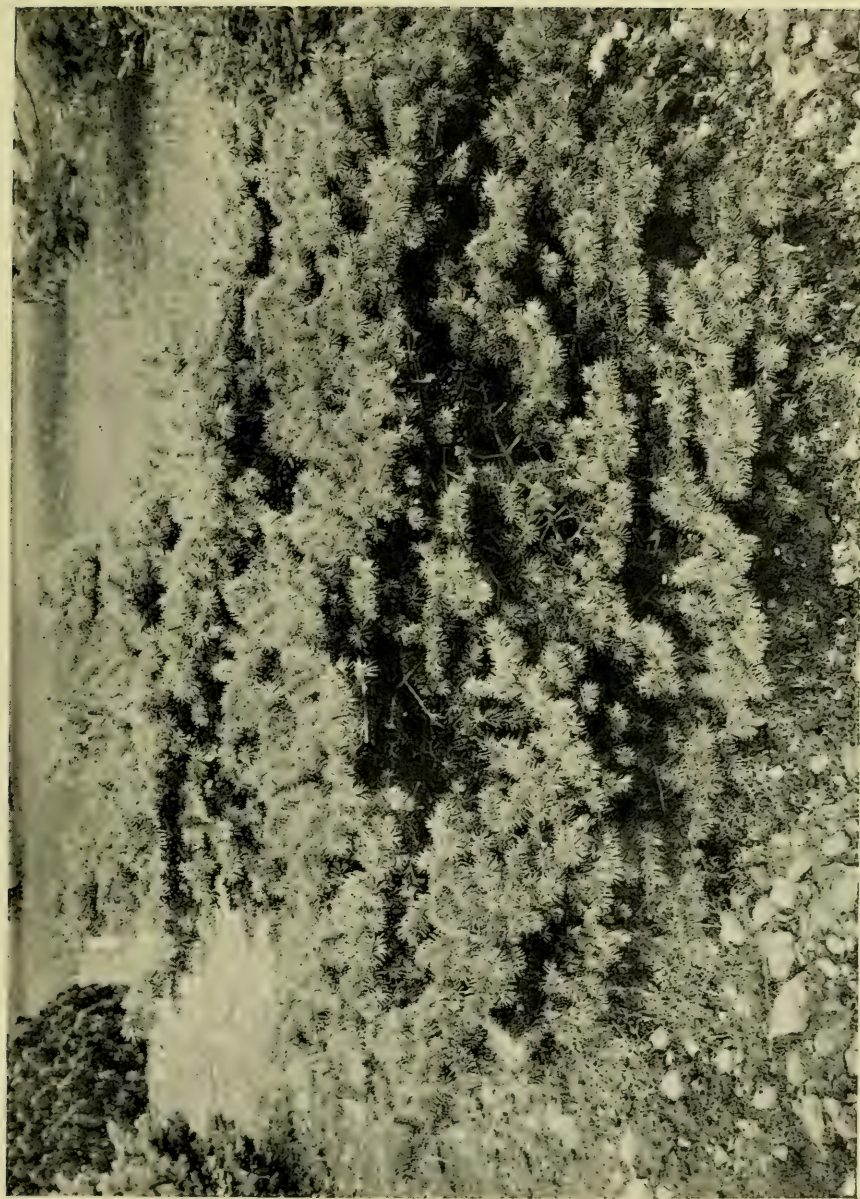
Branches.—Supple and ascending.

Branchlets.—Thin and supple, set at a very narrow angle to branches or in crowded whorls at branch tips. Glabrous, pale whitey-brown. Annual growth 1 inch to 3 inches.

Leaves.—Imperfectly radial, thicker on upper side. Mostly incurved soft, flexible, thin and narrow, tapering to a sharp point. Much thinner, and softer than those of var. *compacta*, and set on the branchlets at a wider angle. $\frac{1}{2}$ to $\frac{7}{8}$ inch long; pale sea-green; about five stomatic lines on each side.

This plant was found among a large batch of seedlings of *P. Engelmanni* raised in the Framingham Nurseries, Mass., from seed collected in Colorado, and was supplied to the Wellesley Pinetum as a dwarf form of *P. Engelmanni*. It is obviously not a form of that spruce, and its parentage was for some time in doubt, but a close examination of it has shown it to possess so many points in common with *P. pungens* that one is justified in considering it a dwarf form of that species. Since Mr. Hunnewell obtained it, it has made a dense pyramidal bush about 4 feet 6 inches by as much through. It is distinct from the Arnold Arboretum form, var. *compacta*, not only in habit, but also in size, colour, and texture of its foliage.

Among the many new Chinese spruces raised from seed at Glasnevin Botanic Gardens, I selected some which



PICEA PUNGENS, VAR. COMPACTA, AT THE ARNOLD ARBORETUM.

appeared dwarf in habit. Some of these in the course of a few years have shown signs of becoming stronger in growth, but a few have remained dwarf. Of these the best is a plant of *P. retroflexa*, which has remained a healthy but minute low conical bush about 12 inches high by 18 inches through.

Buds.—Minute, conical, acute; yellow-brown; bud scales with acute entire apex. Terminal buds girt with a ring of very minute scales with very long points.

Branchlets.—Annual growth $\frac{1}{4}$ to $\frac{3}{8}$ inch; thick and stiff; glabrous light yellow.

Leaves.—Imperfectly radial; $\frac{1}{4}$ to $\frac{1}{2}$ inch; flattish, curved, about two stomatic lines on each of three sunken surfaces separated by a raised midrib; leaves terminating in a rather long cartilaginous point.

Branches.—Very short, stiff, and crowded; branchlets crowded and ascending.

***P. rubra*, Lk. (1841).**

Syn.: *P. rubens*, Sargt. ("Silv. N. Amer.," 1898).

The red spruce inhabits Eastern North America, from Prince Edward Island through Massachusetts to North Carolina, and though introduced to Europe over 150 years, so far as I am aware, the dwarf form described, which I found, is the only recorded dwarf form produced by this species.

***P. rubra*, var. *crista-galli*.**

Buds.—Usually fasciated—three into one—making a minute cockscomb-like cushion; dark red, resinous; terminal bud girt with a ring of ciliate scales with long subulate points.

Branches.—Narrowly ascending; surmounted by flat, fan-shaped whorls of minute, frequently flattened and fasciated branchlets.

Branchlets.—Annual growth about $\frac{1}{2}$ inch; yellow-red; with occasional short erect pubescence, mostly in grooves

between the pulvini; branchlets nearly all fasciated into cockscombs.

Leaves.—Mostly radial, pointing forward at acute angle; about $\frac{1}{4}$ to $\frac{3}{8}$ inch long; fine and thin, but stiff and sharp-pointed. Light yellow-green with about three stomatic lines on each side.

A curious seedling form which I found, and now about ten to twelve years old; a tiny bush, 7 by $5\frac{1}{2}$ inches, and inclined to make a perfectly shaped cockscomb-like head. It is very distinct, every branchlet being fan or comb shape.

P. Schrenkiana, Fisch.

Introduced in 1840 from West Central Asia—Thian-Schan and Altai Mountains. It seems to be a geographical form of *P. excelsa*, differing from it chiefly in its domed shape, brown buds, radial leaves, and smaller cones with rounded scales.

P. Schrenkiana, var. *globosa*, Schelle (Beiss., ii. 243).

Beissner records in the Botanic Garden at Tübingen a compact globular form twenty-five years old, about 5 feet in diameter.

P. Sitchensis, Traut.

Syn.: *Abies Menziesii*, Lindl.

The Sitka spruce of North-West America grows to 200 feet in its native habitat, and more than half that in Europe (a tree in my own garden is 106 feet). The little plant hereunder described I found growing in good soil, and so far it shows no sign of attempting to become arborescent:

P. Sitchensis, var. *microphylla*.

Buds.—Minute—about $\frac{1}{16}$ inch; ovoid; scales ovate and obtuse.

Branches.—Few, ascending and irregular, bearing branchlets in occasional crowded whorls.

Branchlets.—Glabrous, shining white-brown; very thin and fine. Annual growth $\frac{1}{4}$ to $\frac{1}{2}$ inch, mostly in crowded whorls at ends of branches.

Leaves.—Few, very fine and heath-like; $\frac{3}{16}$ to $\frac{3}{8}$ inch; flat, with two single stomatic lines on the upper side and two rows of two to three each on the under sides.

A stunted, narrow, upright little tree which I found growing in a plantation of normal *P. Sitchensis*, and apparently twelve to fifteen years of age. It is now about 10 inches high, and has about three tiers of whorled branchlets up the main stem (growing close to it) and odd, occasional ascending branches crowned with tiny whorls of branchlets, the whole making a narrowly upright little bush. The buds, branchlets, and leaves are typical *P. Sitchensis*, but the latter are so fine and heath-like as to appear more like hairs.

PINUS, L.

The dwarf pines are not very numerous. There are more than fifty species of pine, and only thirteen of these have produced dwarf forms, but some of the species not described here are themselves so slow in growth that they might be utilised for a considerable time in rock and small gardens. Pines that might be grown in this manner are: *P. Albicaulis*, *P. Cembra*, *P. edulis*, *P. monophylla*, *P. Balfouriana*, *P. aristata*, *P. parviflora*, *P. pentaphylla*, and *P. Peuke*.

P. Cembroides, Zucc.

In my possession is a curious dwarf seedling form, said to have been raised from imported *P. Cembroides* seed. It is a sport having affinity to several species, mostly those in the *Cembroides* section, but it differs from every known species to such an extent that it is impossible to identify it absolutely with any of them.

Buds.—Minute, ovate or cylindrical; scales few; imbricated green edged with brown; scale tips neither appressed

nor free. Buds usually in groups of five coalesced in one, the lower buds growing out of the inner central bud and pushing aside its lower scales as they grow. The buds are almost completely concealed by the leaves.

Branchlets.—Stout, very short, flexible, and rather crowded. Pale green-brown fading to ash-brown. Young branchlets mostly covered with short, light brown pubescence varying considerably in density.

Leaves.—Triangular in section, extremely variable both in size and number, size varying from $\frac{1}{4}$ inch to $4\frac{1}{2}$ inches. Number varying from one to five in a sheath, but mostly in twos and fives. Shorter leaves straight, thin and fine, slightly recurving; longer leaves slightly twisted. Leaves borne singly or in pairs, usually stouter and longer. All leaves pale grass-green with stomatic lines on two sides and none on outer side. Margins sometimes entire, sometimes serrulate towards their tips. Leaves borne in dense tufts at ends of branchlets, and also occasionally in dense patches about midway up the branchlets; in the latter case they are uniformly small, having the appearance of larch or cedar leaves, and persist for several seasons.

Leaf-Sheath.—Brown, persistent, rolling back and forming a rosette.

This curious sport is now about fifteen years old, and has made a tiny crowded bush about 9 inches high. It will be seen from the above description that it has points in common with practically all the *Cembroides* groups—*P. Cembroides*, *P. edulis*, *P. monophylla*, and *P. Parryana*, and also with *P. Balfouriana*; but Professor A. Henry agrees that the anatomy of its leaves identifies it more nearly with the *Cembroides* group than with the *Balfouriana* group. It may possibly, in the future, produce a normal branch, but for the present, having regard to its stated origin, one can only tentatively recognise it as a seedling sport of *P. Cembroides*. It is a most interesting little pine.

P. densiflora, Sieb.

Syn.: *P. Massoniana*, Hort, not Lamb.

The Japanese red pine is found in Japan, especially in the south, also in Korea and West Szechuen, and was introduced to Europe by Siebold in 1854. It is a favourite tree with Japanese gardeners, and in addition to the dwarf forms described there are many larger garden forms, and also many artificially dwarfed specimens in Japan. The arborescent type grows up to 100 feet in height, and is not unlike the Scots pine—*P. sylvestris*—but its green leaves and glaucous young branchlets easily distinguish it from that species.

P. densiflora, var. pendula, Mayr.

A pendulous, sometimes prostrate, form which looks best when allowed to fall over a bold rock. I have plants ten years imported from Japan that, so far, are very slow in growth, but specimen branches sent to me from the Arnold Arboretum as var. *prostrata* of the same form, are much freer. The Arnold Arboretum plant has leaves, etc., normal. The leaves on my plants are somewhat shorter and stouter than the type, but they are otherwise normal. Beissner (ii. 438) states that in Japanese gardens other dwarf forms are found: (a) var. *aureo-pendula*; (b) var. *globosa*, a semi-globular bush with leaves half as long as the type; (c) var. *Asamensis*, a stunted form. None of these, as far as I am aware, have yet been introduced into European cultivation.

P. densiflora umbraculifera, Mayr.

Syn.: *P. densiflora*, var. *Tanyosho* (of Japan).

Buds.—Cylindrical; dark brown; resinous.

Branchlets.—Annual growth about $1\frac{1}{2}$ inches; glabrous—light brown; raised pulvini.

Leaves.—In twos; $1\frac{1}{4}$ to $2\frac{1}{4}$ inches; soft, slender, slightly twisted, light green, margins serrulate; resin canal marginal; leaf-sheath under $\frac{1}{4}$ inch, dark brown, persistent.

A round, flat-topped, table-like bush, bearing minute cones while quite small.

Beissner (p. 291) mentions a form—*P. tabulæformis* (Carr. "Conif.," 2nd ed., 510), a dwarfish bushy tree, with thick crowded branchlets in whorls, shiny yellow bark, and stiff thick leaves 4 inches long, in twos, rarely in threes. The branches short and widespreading, making a broad table-like bush.

He goes on to state that this plant has been designated a monstrous form of *P. densiflora*. From seed of it introduced into England from China about 1862, normal *P. densiflora* is said to have resulted.

Siebold has described a dwarf form of his *P. Massoniana* (*P. Thunbergi*, Parl.) as having branches standing out horizontally. Beissner suggests that this plant of Siebold's might possibly be the *P. tabulæformis* in question.

This form cannot be identical with var. *umbraculifera*, nor can it be var. *Bandaisho* of Japanese gardens, which is described as similar to var. *Tanyosho* (*umbraculifera*), but with even shorter needles.

***P. excelsa*, Wall., var. *nana*, R. Smith** ("Pl. Fir Tribe," 35, 1876).

A plant under this name was offered in old catalogues of R. Smith of Worcester and Lawson Company of Edinburgh, dated 1876. I can find no description of it.

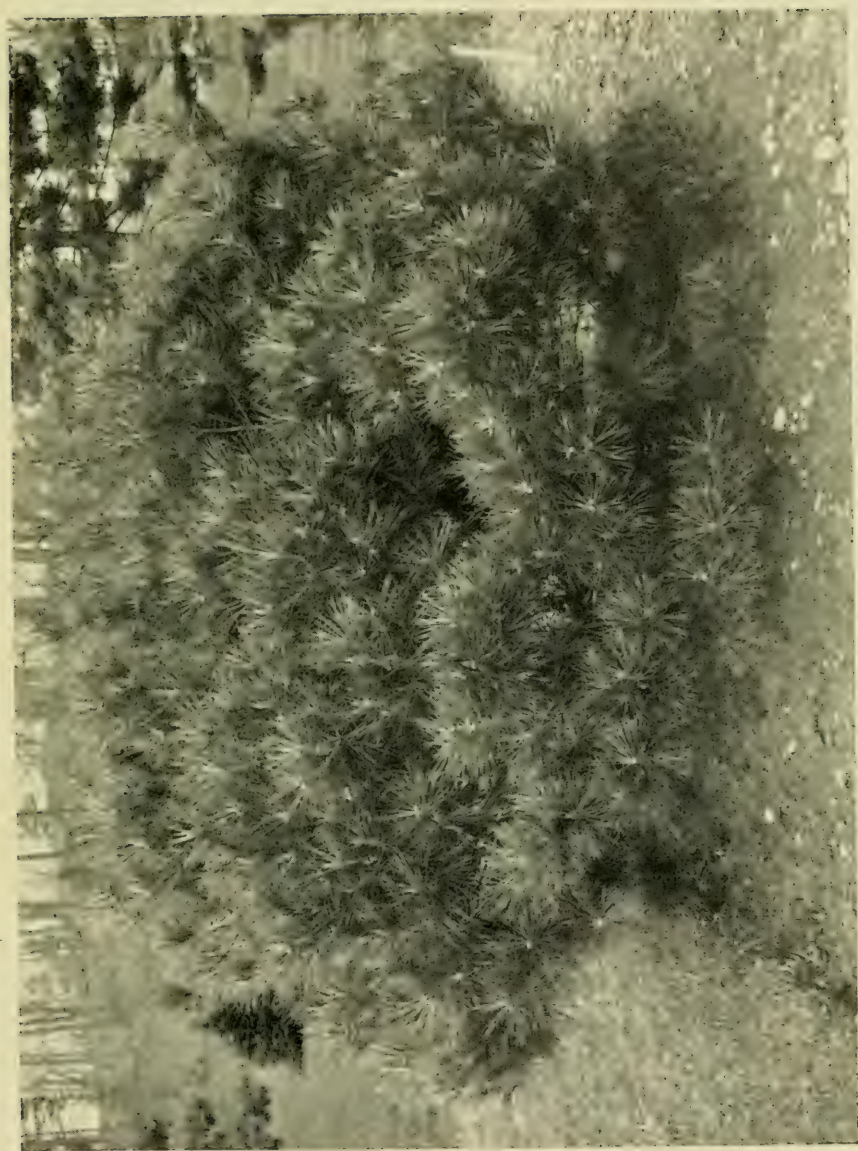
***P. laricio*, Poir.**

Syn.: *P. nigra*, Arnold.

The Corsican pine is found distributed throughout Southern Europe and Asia Minor, and exceeds 100 feet in height.

***P. laricio*, var. *Balkanica*, Velenowsky** ("Fl. Bulg.," Sup. 1).

Beissner (ii. 413) states that Professor Adamovic found this in the Krummholz region—a stunted form with shorter and more crowded leaves.



PINUS DENSIFLORA, VAR. UMBRACULIFERA, AT THE ARNOLD ARBORETUM.

P. laricio, var. **prostrata**, Beiss. (ii. 413, ex "Mitt. d. d. d. Ges.," 1900, 26).

A "knee-forming" creeping form with widespreading branches; otherwise normal.

P. laricio, var. **Moseri** (*Journal de la Soc. Franc.*, 1900, 53).

A distinct globular form raised by Moser at Versailles; about 2 metres through, with foliage turning to gold in winter like that of *P. sylvestris*, var. *aurea*.

P. laricio, var. **pumila aurea**, Beissner (i. 243).

A compact dwarf form with yellowish foliage.

P. laricio, var. **pygmæa**, Rauch.

Syn.: var. *nana*, Hort.

Buds.— $\frac{1}{8}$ to $\frac{1}{4}$ inch; cylindrical, tapering to a long narrow point; brown, resinous, scales appressed.

Branchlets.—Annual growth inappreciable; very crowded; glabrous, dark brown.

Leaves.—In twos, in thick "mats"; backs convex, faces flat; $2\frac{1}{2}$ to 3 inches; very twisted; green both sides; margins serrulate; sharp-pointed. Leaf-sheath persistent.

A very slow-growing, dense globular bush; the leaves twisted and forming a dense mat or mop-head. In one form the foliage turns a sickly yellow in winter; my best specimen is about 3 feet by 3 feet through, but one at Kew, forty years old, is a rounded bush, 8 feet high (Bean, ii. 183).

P. laricio, var. **monstrosa**, Beiss. (i. 244).

A monstrous dwarf form with very short spreading branches and crowded dark green leaves.

P. laricio Bujoti, Carr. ("Conif.," ii. 493, 1867).

Syn.: *P. sylvestris Bujoti*, Hort (in error).

Carrière describes this, as sending up a single leader. No branches. Branchlets and side branchlets very numerous, short, forming a compact mass which covers all the stem. Leaves very crowded, twisted, deep green.

This variety, always bushy and stunted, was found by M. Bujot, nurseryman, near Château-Thierry. I cannot trace it in cultivation.

P. leucodermis, Antoine.

Syn.: *P. laricio*, var. *leucodermis*, Christ.

Buds.—Ovoid; $\frac{1}{2}$ to 1 inch; dark brown.

Branchlets.—Light brown to grey; glabrous.

Leaves.—In twos; very rigid and sharp-pointed; 2 to 3 inches; dark green; margin serrulate. Leaf-sheath $\frac{1}{2}$ inch; persistent.

This pine, a native of Western Serbia, grows up to 90 feet in its native habitat, but appears to be so slow-growing in Great Britain that I have included it.

P. halepensis, Mill., var. *rotundata*, Carr. ("Conif.," ii. 509).

Syn.: *P. d'Alep Boule*, Hort. (Carr.).

Branches very short and excessively crowded. Slender leaves, short. According to Carrière this makes a tiny, round, and very compact bush, possibly originating in a "witches'-broom."

P. montana, Miller, var. *pumilio*, Willkomm.

Buds.—Resinous; $\frac{1}{4}$ to $\frac{1}{2}$ inch and cylindrical; ovoid.

Branchlet.—Pale brown, glabrous; pulvini keeled.

Leaves.—In twos, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, rigid, sometimes twisted; dull green; margins serrulate; resin canal marginal. Leaf-sheath about $\frac{1}{2}$ inch.

This form of *P. montana* sends up several leaders, and forms a low-spreading mass varying in height—eventually from 4 to 10 feet high—and much more in width. Special forms are often picked out from the seed bed, and one should try to get a slow-growing form. This pine is often supplied as *P. pumilio* or *P. Mughus* (var. *Mughus*, Willkomm, in reality differs but slightly), and must not be confused with *P. pumila*, Regel (*q.v.*).

P. montana is hardy and easy to transplant, but grows fairly rapidly, and is too spreading to be allowed near any small conifers.

P. Pinaster, Sol., var. **minor**, Loisleur ("Nouv. Duhamel," v. 242, 1812).

A plant under this name, without description, appears in an old catalogue (1875) of R. Smith of Worcester.

P. resinosa, Solander.

The red pine of Eastern North America is akin to *P. laricio*. So far no dwarf variations have been recorded from the seed bed or the nursery, but in 1908 five dwarf trees were found growing together in the woods in New Hampshire and transplanted. Four of these are still alive and all practically the same size. They are growing in the grounds of Mr. George A. Carpenter, Wolfeboro', New Hampshire, and of them Professor Sargent has sent me specimen branches and photographs. They may be thus described:

P. resinosa, var. **globosa**, Rehder.

Buds.—Conical; pale brown; under $\frac{1}{2}$ inch; covered with white resin.

Branchlets.—Yellowish; glabrous; raised pulvini; short and very crowded.

Leaves.—In pairs, very densely crowded and forming tufts; unequal in length—4 to $6\frac{1}{2}$ inches; flexible; semi-terete; margins serrulate. Leaf-sheath persistent, $\frac{3}{8}$ to $\frac{3}{4}$ inch.

A strong-growing globular shrub; compact and densely branched; measuring in 1921 $5\frac{1}{2}$ feet high by $8\frac{1}{2}$ feet in diameter.

P. Thunbergii, Parl.

Syn.: *P. Massoniana*, Sieb. and Zucc. (not Lamb.).

A Japanese pine, akin to *P. laricio*; much used in Japan for training into dwarf plants.

It was introduced into Europe in 1862, and in its native habitat reaches 100 feet. It is an interesting species with dark bark; short and stiff dark green leaves borne in twos, and light grey winter buds.

I have met with none of its dwarf forms in European cultivation, but Mayr ("Abiet. de Japan," 1890, p. 89) mentions several in cultivation in Japanese gardens of which the most distinct seem to be:

P. Thunbergii, var. *globosa*.—Described as a compact bushy globular form.

P. Thunbergii, var. *tortusa*.—A form with twisted and contorted branchlets.

P. Thunbergii, var. *pendula*.

For the supposed dwarf form of this—*P. tabulæformis*—see under *P. densiflora*, var. *umbraculifera*.

***P. parviflora*, Sieb. and Zucc.**

A small compact Japanese pine; introduced into Europe in 1846. It grows so slowly that it is frequently utilised in small gardens and for lawn planting. Var. *glauca* is even more suitable for such purposes. Many of the Japanese artificial dwarf pines are trained from this species; they also dwarf it by grafting it on *P. Thunbergii*, an uncongenial stock.

***P. parviflora*, var. *brevifolia*, Beiss. (ii. 358; "Mitt. d. d. d. Ges.," 1900, p. 95).**

Buds.—Ovoid, not acuminate; about $\frac{1}{8}$ inch. Scales with some of their tips free.

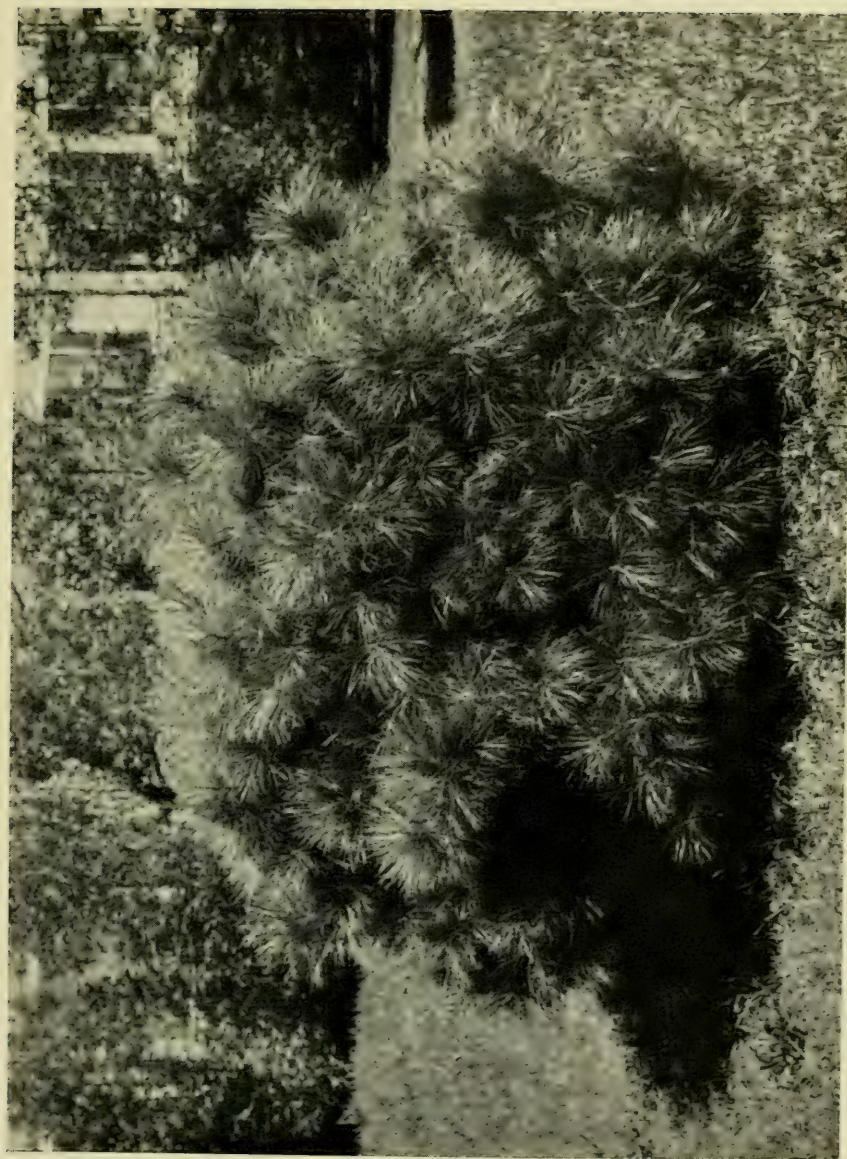
Branchlets.—With slight scattered pubescence. Annual growth $\frac{1}{2}$ to 1 inch.

Leaves.—In fives, about $\frac{3}{4}$ inch; very thick, stiff, and curved; ending in a blunt apex; green outside, very glaucous white inside. Persistent two to three seasons. Leaves on current year's branchlets very crowded, tightly pressed to one another in their bundles, and the bundles to the branchlet.

Leaf-sheath, $\frac{3}{8}$ to $\frac{1}{2}$ inch, deciduous; leaf margins slightly serrulate.

A very slow-growing pine, making as a rule a low, broad pyramid, but occasionally making a rounded bush.

Beissner ascribes its introduction into Europe to Barbier



PINUS RESINOSA, VAR. GLOBOSA, ON MRS. GEORGE CARPENTER'S ESTATE, WOLFEBORO, N.H.

of Orleans, and further states (ex Mayr, in "Abiet. de Japan," 1890, p. 94) that var. *brevifolia* is cultivated in Japan in three forms: (1) One with shorter leaves with white-yellow variegated leaves; (2) var. *oculis draconis*, a spotted form; (3) var. *tortusa*, with recurving, cockscomb-like leaves.

P. parviflora, var. *nana*, Carr. (ii. 385, 1867).

Syn.: *Hime-gojo-matsu* (Japan).

Carrière describes this as having few, short, and erect branches. Leaves much shorter than the type. A delicate, not very vigorous plant.

The only plant of this variety that I have seen in cultivation is in my own garden. It was imported from Japan by a nurseryman, and is now about thirty years old. I ascribe its lack of vigour to the probability of its being grafted upon an uncongenial stock—possibly *P. Thunbergii*. Its leaves are less curved, much finer, and rather shorter than those of var. *brevifolia*, and its leaf bundles are much looser. It does not appear to retain its foliage for more than one season, and its habit is very thin and open. It has made a minute flat-topped bush 18 by 21 inches.

P. pentaphylla, Mayr.

Of this, Beissner (ii. 356), quoting Mayr ("Abiet. de Japan," p. 94), gives two dwarf forms—var. *brevifolia* and var. *tortusa*, but since *P. pentaphylla* differs but slightly from *P. parviflora*, except in the size of its cones, and as these dwarf forms rarely bear cones, it is impossible, in the absence of mention of any points of distinction, to say whether these two alleged forms of *P. pentaphylla* differ from, or are identical with, the dwarf forms of *P. parviflora*.

P. pumila, Regel ("Bullet. Soc. Nat. de Mosk.," i. 211).

Syn.: *P. Cembra pumila*, Pall.

P. pygmæa, Fisch.

P. Cembra nana, Hort.

Buds.—Ovoid; acuminate; resinous; scales with long points usually pressed together.

Branchlets.—Thickly coated with shaggy brown pubescence; pulvini prominent.

Leaves.—In bundles of five; about $1\frac{1}{2}$ to 2 inches long; very dense on shoot; pointing forwards. Slender, curved, margins serrulate or sometimes entire. Resin canal marginal; basal sheath deciduous.

The Northern Siberian and Japanese form of *P. Cembra*, and the smallest of all the pines, and extremely rare. Elwes and Henry record the history of a specimen planted at Dropmore in 1817. It was measured in 1837, and was then 6 inches high, and in 1866 it had soared to $8\frac{1}{2}$ inches! so there is not much fear of it growing too tall for the average rock garden. My largest "specimen" is about 7 inches high by 8 inches through.

Bean ("Trees and Shrubs," ii. 176) states that it was in cultivation early last century, and was lost sight of until recently reintroduced by Captain Clinton Baker. On Mount Hakkoda, Japan, at 6,000 feet, Professor Sargent saw impenetrable thickets of it, a few feet high and covering hundreds of acres.

Beissner (ii. 366) differentiates between *P. pumila*, Regel, and *P. Cembra pygmæa*, Carr. ("Conif.," i. 297). He describes the latter as a small bush spreading 40 cm. high, with short, very fine, spreading and pendulous branches, and shorter, fine, irregular leaves. A dwarf form like *P. pumila*. Apart from its habit, the differences between *P. pumila* and *P. Cembra* are slight, the chief being the amount of marginal serrulations of the leaves and the position of the resin canal. As Beissner does not refer to either of these in his description of *P. Cembra*, var. *pygmæa*, it is impossible to be certain about this plant, which no longer appears to be in cultivation. Beissner's description follows Carrière's, and as the latter gives as an example of *P. Cembra pygmæa* the Dropmore plant of *P. pumila* already referred to, there seems very little

authority for this alleged dwarf form of *P. Cembra*, but in an old catalogue of the Lawson Nursery dated 1875, a *P. Cembra nana* (a synonym of *P. pumila*), and a *P. Cembra*, var. *pygmæa*, are both offered for sale.

P. Strobis, L.

The white or Weymouth pine was introduced from Eastern North America in 1705, where it reaches 150 feet in height, and in vars. *umbraculifera* and *prostrata* it has supplied us with two of the best dwarf pines in cultivation.

There is a considerable amount of confusion about some of the varieties of *P. Strobis*. Carrière ("Conif.," 302, 1855) makes his var. *nana* synonymous with vars. *brevifolia* (Loud.) and *compressa*, and describes var. *nana* as a "bushy pyramidal shrub, leaves slightly shorter than the type, not a very distinct variety."

Gordon, writing about the same date, and describing var. *brevifolia*, Loud., which he makes synonymous with var. *compressa*, Loddiges, says its leaves are "much shorter and slenderer and growing closely compressed round the shoots—a singular-looking variety."

Beissner, in 1891, makes var. *nana* synonymous with vars. *brevifolia*, Loud., *compressa*, and *pygmæa*, and describes it as a "bushy roundish, stunted, globular dwarf form with shorter leaves and crowded branchlets."

It would appear from these descriptions that neither of the forms described by Carrière and Beissner as var. *nana* are identical with var. *brevifolia*, Loud., nor do they appear to be identical with one another.

P. Strobis, var. brevifolia, Loud. ("Encyl. of Trees," 1018; 1842).

Seems to be no longer in cultivation. I have occasionally received plants under this name from nurserymen, but I have invariably found them to be forms of *P. parviflora*.

P. Strobis, var. nana, Carr. ("Conif.," 34, 1855).

Seems also to have disappeared, and judging from his description, it was not distinct enough to be missed.

P. Strobis, var. *nana*, of Beissner.

May be either var. *umbraculifera*, Carr., or var. *nana*, Hort. It is impossible to say which, for Beissner describes another form under the name of var. *umbraculifera*. This he distinguishes from his var. *nana* by its unequal, shorter leaves and smaller habit. But both var. *umbraculifera*, Carr., and var. *nana*, Hort, have unequal leaves of similar lengths.

All that one can say with any certainty is that this bunch of names covers at least three distinct forms—namely: Vars. *brevifolia*, Loud.; *nana*, Hort; *umbraculifera*, Carr.; and as the first cannot be traced in cultivation, I have nothing to add to Gordon's description of it already quoted in full above.

P. Strobis, var. *radiata*.

Syn.: var. *nana*, Hort.

Buds.—Ovoid; acuminate apex; scales appressed; dark brown; about $\frac{1}{8}$ inch.

Branchlets.—Annual growth about 2 inches; slender; oak-brown; densely crowded; slight pubescence at base of leaf-sheath.

Leaves.—In fives, in dense tufts at ends of branchlets, and also growing fairly thickly up the stem, all pointing up or at right angles—not drooping. Irregular in length—mostly about 3 inches, but usually some considerably shorter on summit of tuft, and occasional whorls of minute leaves—under $\frac{3}{4}$ inch—half-way down the branchlets. Leaves three-sided, outer very dark green; two inner very glaucous blue-white. Very slender, but stiffer than those of var. *umbraculifera*. Margins serrulate. Sharp-pointed. This makes a roundish or globular shrub, very dense and compact. I have a specimen about 4 feet by 4 feet.

P. Strobis, var. *umbraculifera*, Carr. ("Conif.," ii. 400, 1867).

Buds.—Ovoid; apex acuminate; scales appressed; red-brown; about $\frac{3}{16}$ inch.



PINUS STROBUS, VAR. NANA, AT THE ARNOLD ARBORETUM.



PINUS STROBUS, VAR. UMBRACULIFERA, AT KNAPTON.

Branchlets.—Annual growth 1 inch to 2 inches; glabrous, with distinct pubescence at base of leaf-sheath; red-brown; very crowded.

Leaves.—In fives—about $3\frac{1}{2}$ inches long; very narrow, thin, flexible, drooping and fine; margin serrulate; sharp-pointed; light green; leaf-sheath about $\frac{1}{4}$ inch, deciduous. Leaves grow in dense, *drooping tufts*, and occasionally at the summit of a tuft some leaves appear barely half the length of the others.

This is a distinct and very pretty form, making a vase-shaped bush with a round absolutely umbrella-shaped head of crowded slender branchlets. My best specimen is about 5 feet high by 4 feet through.

It is readily distinguishable from var. *radiata* by its shape, the colour of its leaves, and especially by their arrangement. The leaves in the tufts of var. *nana* stick out in all directions like a dry mop-head. The tufts of var. *umbraculifera* all droop like a wet mop-head.

P. Strobis, var. pumila, Beiss. (i. 292).

A dwarfish bushy globose form with moderately long silver-green leaves. Beissner makes var. *pumila* synonymous with var. *minima*, but var. *minima*, Hort, in my garden is so distinct that I describe it separately.

P. Strobis, var. minima.

A minute form, branchlets making an annual growth of only 1 inch to $1\frac{1}{2}$ inches. Leaves very thin and fine, but fairly stiff, dark green, about 1 inch in length; slightly recurved.

P. Strobis, var. prostrata, Beiss. (ii. 350, ex “Mitt. d. d. d. Ges.,” 1899, 107).

A distinct creeping form. The stem, rising from the ground, soon “knuckles” so that the branches, at first horizontal, soon spread over the ground.

Branchlets and foliage are normal.

This form was first found by Rehder in the Arnold

Arboretum. A plant of it was sent to Kew in 1893, where it is perfectly prostrate and hangs vertically over the face of a stone (Bean, ii. 191). Later Beissner found a similar form in a garden at Langensalza, East Friesland, Germany.

P. Strobis, var. *pendula*, Beiss. (ii. 350, ex "Mitt. d. d. d. Ges.," 1893, 29).

A seedling form in the Schlossgarten at Benrath, near Düsseldorf, making a roundish bush 2 metres high, with pendulous branches.

P. sylvestris, L.

The Scots pine is found nearly all over Europe and beyond the Urals into Asia, and it has produced numerous garden forms. In addition to those described, one might include var. *fastigiata*, a slow-growing narrow upright form; and var. *argentea*, with very glaucous foliage. In time these become good-sized trees.

P. sylvestris, var. *pumila*, Beiss.

Syn.: var. *glauca nana*, Hort.

Buds.—Pointed; oval; tips free; about $\frac{1}{4}$ inch; red and resinous.

Branchlets.—Annual growth about 2 inches; shiny green; smooth.

Leaves.—In twos; blue-green; linear, stiff, twisted; margin serrulate; from 1 to $1\frac{1}{2}$ inches long. Leaf-sheath persistent; white to brown; $\frac{1}{3}$ inch.

Makes an open round bush of ascending branches. A form sent out by some nurseries as var. *Watereriana* seems very close to, if not identical with, this, but I have only seen small plants of it.

P. sylvestris Beauvronensis, Hort.

Buds.—Pointed; oval; under $\frac{1}{4}$ inch; some tips free; very resinous; brown-red.

Branchlets.—Annual growth about $1\frac{1}{2}$ inches; green; shiny; smooth.



PINUS SYLVESTRIS, VAR. PYGMÆA, AT KNAPTON.

Leaves.—In twos, about $\frac{1}{2}$ inch barely perceptibly serrulate; some slightly twisted, but most pressed tightly face to face by disproportionately long (about $\frac{1}{4}$ inch) leaf-sheath, which is white to pale brown.

A very thickly-growing densely branched little bush; branchlets almost at right angles to branches. Its appearance suggests a “witches’-broom” to have been its origin. Beissner (i. 232) states that plants of this form twenty-five years old are scarcely $\frac{1}{2}$ metre high. He also states (ii. 434) that it originated in the nurseries of Transon Frères at Beauvronne, near Orleans.

My best specimen is about 9 inches by 18 inches.

P. sylvestris, var. pygmæa, Beiss.

Syn.: var. *globosa nana*, Hort.

Buds.—Oval; pointed; $\frac{3}{16}$ inch; tips of scales free; red; resinous.

Branchlets.—Annual growth 1 inch to $1\frac{1}{4}$ inches; crowded; shiny red; glabrous.

Leaves.—In twos, about $\frac{1}{2}$ to 1 inch; stiff, thick, very twisted; margins serrulate, not so glaucous as var. *pumila*. Leaf-sheath under $\frac{1}{4}$ inch; dark brown.

A dense round bush of very slow growth. I have a specimen 3 feet by 3 feet 6 inches.

P. sylvestris, var. tabulæformis.

A plant under this name appears, without description, in an old catalogue of Barron of Borrowash, dated 1875.

P. sylvestris, var. umbraculifera, Beiss. (i. 233).

Buds.—Oval, pointed; $\frac{1}{4}$ to $\frac{1}{2}$ inch; tips of scales free; light red-brown; non-resinous.

Branches.—Few, spreading, and slightly ascending.

Branchlets.—Few, nearly at right angles to branches, and slightly ascending; light brown; fairly thick; annual growth 2 to 3 inches.

Leaves.— $1\frac{1}{2}$ to 3 inches long; stout; twisted; in twos. Margins serrulate: those at base of branchlets shortest

and slightly appressed; those at tips of branchlets longest and spreading. Leaf-sheath persistent; about $\frac{3}{16}$ inch; light red-brown.

A broad round shrub of very open growth, of which I have only young plants.

P. sylvestris, var. Genevensis, Beiss. (ii. 534).

Buds.—Minute—under $\frac{1}{8}$ inch, very dark crimson-brown.

Branches.—Few and spreading.

Branchlets.—Very fine and supple; annual growth $\frac{1}{2}$ to 1 inch; grey-brown.

Leaves.— $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches; very pale glaucous grey; very thin and flexible; much finer and narrower than any other form. Leaves borne in small tufts on ends of branchlets, rest of branchlet bare; the leaves in the tufts are more compressed and less spreading than in vars. *Beauvronensis* or *pygmæa*.

A distinct pygmy form of slow, spreading growth, of which I have, and have seen, only small specimens. I believe this originated in the nurseries of Simon-Louis Frères of Metz.

P. sylvestris, var. nana, Carr. (i. 373).

Buds.—Small— $\frac{5}{16}$ inch; conical; light brown; non-resinous.

Branches.—Few and ascending.

Branchlets.—Short and stiff, ascending at a very narrow angle; annual growth $1\frac{1}{2}$ to 2 inches; dark brown.

Leaves.—Densely crowded (but not quite so crowded as those of var. *pyramidalis compacta*), stout, and stiff; appressed to branchlet and to each other; broad—about $\frac{1}{16}$ inch and from 1 inch to $1\frac{1}{2}$ inches long; rarely twisted; inclined to incurve; very glaucous blue-green.

A narrow fastigate form with its branches compressed against the main stem, but not so compressed as those of var. *pyramidalis compacta*, and differing also from that variety in the colour of its leaves and the absence of leaves

on the main stem. Otherwise young specimens of these two varieties are somewhat alike.

This form has been cultivated for many years in Antony Waterer's Nursery at Knap Hill, Woking, and is probably the form sent out by that nursery as early as 1875 as var. *pumila*, but var. *pumila*, Hort (*q.v.*), is of stronger and more open growth. I have a specimen about 3 feet high.

P. sylvestris, var. pyramidalis compacta.

Buds.—Stout, oval; conical; $\frac{3}{8}$ to $\frac{1}{2}$ inch; red-brown; very resinous.

Branches.—Main stem very thick and stout; branches few and ascending.

Branchlets.—All ascending at a very narrow angle, those around main stem almost appressed to it; annual growth about 2 inches; stout; oak-brown.

Leaves.—Wide—about $\frac{1}{16}$ inch, and about $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches long; stout; shining dark green; compressed and mostly incurving to the branchlets, and densely crowded, not only all up the branchlets, but also up the main stem—in the latter case the leaves are unusually stout and long, and persist for four or five years.

A very distinct narrow pyramidal form originating in the nurseries of Simon-Louis Frères of Metz. I have a specimen about 3 feet 6 inches high by about 2 feet 6 inches at the base.

P. sylvestris, var. aurea, Kent.

Buds.— $\frac{1}{4}$ to $\frac{3}{8}$ inch; oval; pointed; scale-tips appressed; dark crimson-brown; very resinous.

Branchlets.—Annual growth 1 inch to 2 inches; light shiny yellow.

Leaves.—In twos; stiff, twisted points, usually curved; margins serrulate, $\frac{3}{4}$ inch to $1\frac{1}{4}$ inches; sharp-pointed; bright golden-yellow in winter, green in summer. Leaf-sheath about $\frac{1}{8}$ inch; dark brown.

Ultimately a good-sized bushy tree, but of very slow growth. Turns a wonderful bright clear yellow in winter.

P. sylvestris viridis compacta, Hort.

Buds.—Oval; very pointed; $\frac{1}{4}$ to $\frac{1}{2}$ inch; crimson-red; very resinous.

Branchlets.—Annual growth $1\frac{1}{2}$ to 2 inches; green-yellow.

Leaves.—In twos, stiff; much twisted; $1\frac{1}{2}$ to 3 inches; deep lustrous green both sides; margins serrulate. Leaf-sheath about $\frac{5}{16}$ inch; red-brown. A fairly slow-growing small conical tree of very open growth, distinct on account of its vivid grass-green foliage.

P. sylvestris, var. **saxatilis**, Carr. ("Conif.," ii. 483, 1867).

Carrière describes this as a prostrate, spreading shrub—branchlets very numerous and slender, leaves 12 to 25 mm. long—which was found by M. Sénéclauze. When Carrière examined it, it had made no leading shoot, but was flat on the grass like a mat. It was of delicate constitution, and there is no trace of it or of propagations from it. Recently I found a similar absolutely prostrate form which is now in my garden; it has made a similar mat about 4 inches high and 2 feet across.

PODOCARPUS.

Of the many podocarps which inhabit Australia and South America, there are only three which I can consider hardy in this climate. They are akin to the yews.

Podocarpus alpina, R. Brown.

Habit drooping.

Branchlets.—Slender; interlacing in whorls; smooth and green.

Leaves.—About $\frac{1}{2}$ by $\frac{1}{12}$ inch linear; base tapering; apex round or pointed; dark green (not shining) above, paler with stomatic bands beneath.

Fruit.—Red; $\frac{1}{4}$ inch in diameter.

Inhabits Victoria and Tasmania, and grows very slowly. Thirty-year-old plants at Kew are only 4 feet high.

P. Chilina, Richard.

Syn.: *P. Andina*, Hort (not Poeppig).

Branchlets.—Smooth and green.

Leaves.—Linear; straight or sickle-shaped; tapered at base; apex pointed 2 to 4 inches by nearly $\frac{1}{4}$ inch; dark blue-green upper side, paler beneath.

Fruit.—Ovoid; $\frac{1}{3}$ inch long.

Inhabits the Andes of Chili and makes a compact shrub. In Cornwall and Devon it sometimes becomes a tree.

P. Totara, A. Cunn.

Habit spreading.

Branchlets.—Rigid; opposite; dull green; channelled bark.

Leaves.—Arranged spirally and inserted with a twist; linear; $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches; dull yellow-green; grooved above, paler and slightly keeled beneath.

Fruit.—About the size of a cherry, enclosing a round or tapered nut.

A Tasmanian, it makes a low shrub in my garden and seems comparatively hardy.

PRUMNOPITYS, Phil.

Prumnopitys elegans, Philippi.

Syn.: *Podocarpus andina*, Poeppig (not Hort.).

Is generally known in gardens by its synonym.

In cultivation it makes a round or broadly pyramidal bush, dense and slow in growth.

Branchlets.—Smooth and green.

Leaves.—Linear; $\frac{1}{3}$ inch to $1\frac{1}{2}$ inches by $\frac{1}{8}$ inch; tapered at base and stalked; apex abrupt; dark green above, slightly glaucous beneath; leaves arranged radially.

Fruit.—Yellow-white; $\frac{3}{4}$ inch long.

Fairly hardy if sheltered from cold winds.

PSEUDOLARIX, Gord.

Pseudolarix Kaempferi, Gordon, var. **nana**, Beiss. (ii. 300).

Syn.: *Hin-le-Sung* (Chinese).

Beissner states that Fortune found in China a dwarf form of *Ps.-larix Kaempferi*, cultivated in gardens and as a pot plant, varying in height from 12 inches to 3 feet. I have not come across it in cultivation.

P. Kaempferi, var. **Dawsoni**.

Professor Sargent has sent to me photographs and descriptions of a very interesting dwarf form that has recently come into his possession and is now in the Arnold Arboretum. It appears that Mr. Jackson Dawson, former Superintendent of the Arboretum, raised seedlings from seed produced by the big *pseudolarix* in the Wellesley Pinetum in 1895. Some of these seedlings are now growing in the Arnold Arboretum and are from 12 to 15 feet high. Other seedlings which were dwarf in habit were given by Mr. Dawson to Mr. W. Harper, of the Andorra Nurseries, Chestnut Hill, and later found their way back again to the Wellesley Pinetum. One of these is now in the Arnold Arboretum, and although it must be twenty-six years old, it has only made an open, broadly conical bush, about 18 inches high by as much through.

P. Kaempferi, var. **Annesleyana**.

At Castlewellan, the seat of Lady Mabel Annesley in Co. Down, there is a very distinct form. The plant is very old; it is said to be one of the first distributed after its introduction by Fortune—this would make it about eighty years old. It has formed a low bush of horizontal branches; branchlets pendulous and densely covered with leaves. It is now about 9 feet high and has a circumference of 90 feet.



PSEUDOLARIX KAEMPFERI, VAR. ANNESLEYANA, AT CASTLEWELLAN,
CO. DOWN.



PSEUDOTSUGA DOUGLASI, VAR. FLETCHERIANA.

PSEUDOTSUGA, Carr.

For a great many years authorities have linked together the Western North American seaboard *Pseudotsuga* and its Colorado cousin, and called them both *Ps.-tsuga Douglasi*, distinguishing the latter simply by the name var. *glauca*. Considering that the average authority enjoys hair-splitting, this result is somewhat surprising, as the Colorado fir differs considerably from the British Columbian tree—differs considerably more than some pines and spruces which have been separated; and recently it was discovered that the two differ also in smell when crushed, one smelling of resin and the other distinctly of camphor. So var. *glauca* has come into its own at last, and *Ps.-tsuga Douglasi* (syn.: *Ps.-taxifolia*, Brit.) will in future represent the extreme Western fir, and var. *glauca* will be separated from it. At the moment I do not think its name is decided upon, but doubtless the name *Ps.-tsuga glauca* ascribed to it by Mayr in 1901 will be found most suitable. This explanation is necessary in view of the fact that at least one dwarf form has been raised from the Colorado fir, which is placed by itself in the following descriptions:

P. Douglasi has not produced many seminal dwarf forms, although, like many other conifers, it becomes a mere shrub at high altitudes. Professor Sargent records ("Silva of North America," xii. 88) a plant only 18 inches high, but covered with average sized cones, which he found at the head of the Cutbank River, Montana, at 6,000 feet.

P. Douglasi, var. compacta, Beiss. (ii. 419).

Recorded by Beissner as a pretty compact form of crowded growth and shorter denser foliage.

P. Douglassi, var. dumosa, Carr. ("Conif.," ii. 258).

Syn.: var. *Monstrosa*, Beiss. (ii. 419).

Raised by André Leroy, of Angers, France, and described as an ugly, bushy, diffuse, monstrous form with irregular thick branches, the branching irregular, declining or nearly pendant, and very narrow, crowded, short, thin, twisted leaves—some 4 to 6 mm. long, others at ends of branchlets up to 20 mm., making a widespreading bush not more than 2 metres high.

This variety, which resembles a "witches'-broom," remained dwarf, and at more than fifteen years of age was about 4 feet in height.

P. Douglassi, var. argentea compacta, Hans ex Beiss. (ii. 419).

Described as a compact bush of beautiful silver-grey foliage; raised by Hans of Herrnhut from Colorado seed.

P. Douglassi, var. pygmæa.

Syn.: var. *globosa*, Sargt. ("Arnold Arboretum Bullet.," No. 18, 1918), (not Beiss.).

Buds.—About $\frac{3}{16}$ inch; cylindrical; pointed; light brown.

Branchlets.—Glabrous; light brown; annual growth $\frac{1}{2}$ to $\frac{3}{4}$ inch.

Leaves.—Narrow—about $\frac{1}{32}$ inch and from $\frac{1}{2}$ to $\frac{3}{4}$ inch long; light yellow-green.

This is the smallest form I have seen, and according to Sargent it is one of the slowest-growing dwarf conifers in the Arnold Arboretum Collection. It seems smaller and more compact than either of Fletcher's dwarf forms.

P. Douglassi, var. Fletcheri.

Buds.—About $\frac{1}{4}$ inch; narrow; ovate; pointed; red.

Branchlets.—Annual growth about $1\frac{1}{2}$ inches; smooth; shining; grey-brown; with occasional slight short scattered pubescence.

Leaves.— $\frac{1}{2}$ to $\frac{3}{4}$ inch; nearly radial; crowded; narrow; soft; rather sharper pointed than the type; pale yellow-green. Two stomatic bands beneath; not very white.

I have only seen young plants of this, which are all making small, rather loose and open, globose bushes. This form was raised by Fletcher and Son, of Ottershaw Nurseries, Chertsey, and they inform me that the mother plant was, at sixteen years of age, a round bush only 15 inches high.

P. Douglasi, var. **compacta viridis**, Beiss. (ii.; and "Mitt. d. d. d. Ges.," 1902, 52).

Raised by Helleman at Moorend, near Bremen; a regular, rather compactly branched conical form, about 80 cm. high, with short crowded branches and fine short, fresh green, short-pointed radial leaves.

The branch tops are crowded with foliage forming rosettes, in which the unusually red buds appear very striking.

P. Douglasi, var. **compacta glauca**, Beiss. (ex "Mitt. d. d. d. Ges.," 1902, 53).

Raised by Ansorge at Flottbeck. Like the foregoing, a compact, conical form. The short leaves are radial but smaller, and are bluish-green and sharp-pointed.

Buds more pointed and brown, not red.

P. Douglasi, var. **globosa**, Beiss. (not Sargt.); ex "Mitt. d. d. d. Ges.," 1905, 75).

A form at Carl Lutz Sohn in Stuttgart. A fairly regular loose-branched globular form, 75 cm. through.

Branchlets, buds, and leaves normal, the latter fresh green.

P. Douglasi, var. **Fretsii**, Beiss. (ii. 109; "Mitt. d. d. d. Ges.," 1905, 74).

A curious form raised in the nurseries of Frets and Son, of Boskoop, Holland, from imported American seed, making a compact pyramid of rather twisted ascending branches, very small branchlets and buds.

Leaves.—Very short—8 to 12 mm. long, 2 mm. broad. Upper side dark green; under side blue; and arranged

radially, and having the appearance of *Abies Pinsapo*. My plant is already 4 feet high, and will, I think, become a fair-sized tree.

P. Douglasi, var. *leptophylla*.

Buds.—Small— $\frac{1}{8}$ to $\frac{3}{8}$ inch; conical, acute; bright red.

Branches.—Ascending at a narrow angle.

Branchlets.—Annual growth $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches; dark shiny brown; very fine, thin, and sparsely borne; also ascending at a very narrow angle; pubescence thin and scattered.

Leaves.—Radial, all pointing up at a narrow angle; very slender, narrow, and heath-like; $\frac{3}{8}$ to $\frac{1}{2}$ inch; dark shining green above with sunken median groove; under side a stomatic band with a barely perceptibly raised midrib.

A form which I found making a small fastigiate shrub; now 15 inches by $4\frac{1}{2}$ inches. Buds small; branchlets and leaves very small and slender.

P. Douglasi, var. *brevifolia*, Mast. (*Journ. Linn. Soc.*, xxvii., p. 244).

Is described as a plant of dwarf growth, with short leaves arranged radially.

This description seems to fit a form sent to me as var. *taxifolia*, and said to be propagated from a collected Alpine form.

Buds.—Minute; about $\frac{1}{8}$ inch; ovoid; obtuse; dark brown. Bud scale-tips rather free, with round ciliate margins.

Branches.—Short, stout, and few; horizontal or slightly ascending.

Branchlets.—Few; very short; annual growth 1 inch to $1\frac{1}{2}$ inches; light red-brown, with slight scattered pubescence.

Leaves.—Radial; very densely crowded; slightly more so on the outer or upper side; pointing forward and slightly recurved. Stout but very small; from $\frac{1}{4}$ to nearly $\frac{1}{2}$ inch long and just under $\frac{1}{16}$ inch wide; uniform in width, not

tapering, but apex very abruptly rounded and either blunt or occasionally with a minute cartilaginous tip. Upper sides, pale green with median groove; lower sides, with two narrow, not very white, bands of stomata. The leaves when crushed emit a curious, sweet, sickly smell similar to that of gorse or stephanotis.

This has made a low, open irregular bush at present about 2 feet 6 inches by as much through. The smell of the leaves when crushed is quite different to that of *Ps.-tsuga Douglasi* (type) or *Ps.-tsuga glauca* (type).

P. glauca, Mayr, var. **nana**.

Buds.—Similar to var. *Fletcheri*.

Branchlets.—Annual growth $1\frac{1}{4}$ to 2 inches, with rather more pubescence.

Leaves.—Longer, up to 1 inch, stiffer, and rather prickly to touch; dark blue-green above, blue-white beneath and arranged more radially. The growth is stronger and more crowded than that of var. *Fletcheri*, and young plants are becoming broadly conical.

This, the second form raised by Fletcher, has only recently been distributed into cultivation. It seems stronger and less slow of growth than the other.

P. glauca, var. **pumila**.

Syn.: *P. Douglasi pumila*, Beiss. (ii. 110).

Beissner states that Antony Waterer, of Woking, got a First Class Certificate at R.H.S., London, 1899, for a compact bush form of the Colorado variety, with sharp, rather light, green leaves. This plant is still in Antony Waterer's Nursery, and does not appear to have been propagated.

RETINISPORA.

Under the name of *Retinispora*, or *Retinospora* there will be found in gardens and nurseries various forms of cypress and thuya, mostly with juvenile foliage. Originally intended as the name for a new genus, *Retinispora* at first

included only one or two juvenile forms whose origin was not then known; but of late years the name has been so loosely used that in some nurseries one may find under it, not only most of the smaller forms of cypresses, such as *C. obtusa*, *C. pisifera*, *C. thyoides*, but also of thuyas—*Thuya occidentalis* and *T. orientalis*. The parentage of these juvenile forms has now been traced, and they will be found under their proper names, and the name *Retini-spora* is no longer recognised.

SCIADOPITYS.

Sciadopitys verticillata, Sieb. and Zucc.

The umbrella pine is one of the most distinct conifers. Though in Japan it reaches 100 feet in height, in Great Britain it is rarely met with except as a shrub. Its whorls of so-called leaves are like the framework of an umbrella, and it is so slow-growing that it can be utilised in small gardens.

There are pendulous and variegated forms in European cultivation which I have not seen, and Beissner (ii. 449) mentions dwarf forms without description, as existing in Japanese gardens.

SEQUOIA.

Sequoia sempervirens, Endlich.

Syn.: *Taxodium sempervirens*, Lamb.

One does not expect a species like the giant redwood of California (which in its native habitat grows over 300 feet) to produce a dwarf form, but I have met with one in cultivation which, so far, promises to retain its dwarf habit:

S. sempervirens, var. *nana pendula*.

Syn.: var. *pendula*, Rovelli (in "Mitt. d. d. Ges.," 1899, 112).

Branches and *branchlets* pendulous; practically *prostrate*.

Branchlets.—Fine; flexible; very glaucous grey-green; annual growth 1 to 2½ inches.

Leaves.—Linear, terminating in a short, very abrupt point, and set rather far apart with long decurrent bases, and arranged spirally and alternately both on leading shoots and on branchlets, but in the latter case the free part of the leaves—which varies in length from $\frac{1}{8}$ to $\frac{3}{8}$ inch—is twisted in various directions, so that, irrespective of the position of the decurrent bases, the free parts of the leaves arrange themselves almost pectinately, pointing out and forward at an acute angle. Both upper and lower sides are very glaucous grey-green, and the tips of the young shoots are frequently pale yellow or white.

I found this plant growing in the Rock Garden at Curragh Grange, Co. Kildare, without a name, and origin unknown; it is planted, anyhow, over fifteen years in its present position, and is sprouting out from between two rocks and flowing down their sides in a close mat-like formation, and is now about 40 inches long and 36 inches across. I succeeded in propagating a cutting now four years old, but it is still only a few inches in length.

TAXODIUM.

Taxodium distichum, Rich., var. *fasciatum*, Carr. (ii. 185).

This Carrière describes as a dwarf, monstrous form of the deciduous cypress, originating from a sporting branch on the type. It forms a small bush of stout, swollen branches, fasciated and sometimes twisted, covered with linear leaves.

TAXUS, Tourn.

The yews are so slow-growing that most of the arborescent forms can be retained for a time. The dwarf forms are in some confusion. Several mentioned by early writers upon conifers, like Gordon, are now no longer obtainable, and from imperfect descriptions it is not easy to decide whether several forms recently introduced by Continental nurserymen are reintroductions or new varieties.

Taxus baccata, var. *compressa*, Carr. ("Conif.," I.C.).

Is said by Beissner (ii. 48) to have been a seedling of var. *fastigiata*, making a small conical bush with fine, stiff, ascending branches, yellowish bark, and scattered, short, light green leaves.

T. baccata, var. *gracilis pendula*, Lancke ("Deutsch. Dendr.," 47, 1880).

In my garden this has proved the slowest-growing of the pendulous forms; by tying up a leader it can be trained to any height desired; the branches are pendulous, and on reaching the ground will continue to spread over it; the foliage is a beautiful glaucous blue-green, and it bears fruit in quite a small state.

T. baccata, var. *adpressa*, Carr. ("Man. des Plantes," iv. 380).

Syn.: *T. Tardiva*, Law.

T. parvifolia, Wender.

T. bacc. microphylla, Jacq.

A dense widespreading shrub, with leaves about $\frac{1}{4}$ inch long and very narrow. Slow of growth and quite distinct; even slower is its coloured variety—var. *adpressa aurea*.

The green form originated in Dickson's Nurseries at Chester in 1828 (*The Garden*, 1896, p. 268), and the golden form, according to Bean (ii. 581), at the Hands-worth Nurseries, Sheffield. There is also a fastigate form, var. *stricta*.

T. baccata, var. *columnaris*, Carr. ("Conif.," 2nd ed., 738, 1867).

Is described as a small compact column with small gold variegated leaves, and a seedling of var. *fastigiata*. This seems to me to be identical with a curious form that was sent to me some years ago and stated to be a seedling of *T. baccata adpressa aurea variegata*. Its foliage (which is edged with gold) is, however, very similar to that of *T. baccata fastigiata aureo variegata*, but smaller. It is quite distinct in its habit. It is growing slowly; abso-

lutely erect, with but few branches, which are invariably compressed tightly up against the leader, so that the plant, which is now about 4 feet in height, presents the appearance of a loosely folded umbrella. It has maintained an even width from base to top, and is so narrow that a fair-sized curtain ring could be passed up and down its full length. A very striking plant.

T. baccata, var. **horizontalis**, Knight ("Syn. Conif.," ii. 52) and Carr. ("Tr. Gen. Conif.," 518).

Syn.: *T. horizontalis*, Hort.

T. disticha, Wenderath ex Henk. and Hochst. ("Syn. des Nadel.," 354).

"Branches vertical; horizontally spreading; reflexing from summit. Leaves distichous; distant 2 to 5 cm. Up. to 4 mm. wide. Often falcate or rolled back. Raised by M. Bertin, père, nurseryman at Versailles, quite different from var. *Doverstonei*, with which Gordon and his copyists, Henkel and Hochstetter, confused it." This description is Carrière's (2nd ed., 1867, 734), and I have little to add to it. The branches are very stiff and stout, and the branch tips and branchlets are not pendulous. This form is very rare in cultivation: there is an old specimen of it in the kitchen garden at Kilmacurragh, Co. Wicklow, about 3 feet 6 inches high by over 7 feet through.

T. baccata, var. **prostrata**, Bean ("Trees and Shrubs," 1916, 581).

A form of normal growth but prostrate habit. I do not know the origin of this form, and have seen only young plants of it. I have one small specimen obtained from Barron's Nurseries at Borrowash.

T. baccata, var. **Sieboldi**, Beiss. (ii. 54).

Beissner notes this form in the Moscow Nursery—a flat-topped spreading form, similar to the type except in habit. The old plant noted was 1 metre high by 3 metres across, and was round and flat.

T. baccata, var. *ericoides*, Carr. ("Conif.," 1st ed., 519, 1855).

Syn.: *T. empetrifolia*, Gord. ("Pinetum," 390, 1875).
T. microphylla, Hort.

A small, slender, slow-growing variety which rarely sends up a leading shoot.

Branchlets.—Thin, short, and erect.

Leaves.—Dark green; small, very pointed and crowded; often falcate; a little longer and more acuminate than those of var. *nana*.

T. baccata, var. *monstrosa*, Carr. ("Conif.," 1st ed., 519, 1855).

Syn.: *T. sparsifolia*, Loud.

T. baccata Mitchellii, Hort.

Carrière describes this as a dwarf bush not unlike var. *ericoides*, but branches more erect and stouter, and every propagated branch throws up a leader.

Beissner (ii. 54) describes it as a monstrous dwarf bush, with branchlets ascending and irregular, many being small and stunted; leaves set far apart.

I cannot find this variety in cultivation.

T. baccata, var. *procumbens*, Hort. (not Loud.).

A low-growing regular bush with rounded top and pendulous elongated branches in thick compact layers.

Leaves from $\frac{1}{2}$ to $\frac{3}{4}$ inch; light green; on many branchlets pointing up and only slightly forward. A very compact form now growing at Glasnevin; size 3 feet by 7 feet. This is a female form, and must not be confounded with var. *procumbens*, Loud. (a synonym of *T. Canadensis*).

T. baccata, var. *pygmæa*, Beiss.

This, the smallest form that I have seen, was raised some years ago in the nurseries of Messrs. Den Ouden, of Boskoop, Holland. It makes a minute, narrowly ovoid bush of densely crowded, compressed, ascending branches and branchlets; the annual growth of the latter is only

about $\frac{1}{4}$ to $\frac{1}{2}$ inch. The leaves are from $\frac{1}{8}$ to $\frac{1}{4}$ inch in length, crowded, stiff, usually recurving, oval, disproportionately wide.

T. baccata, var. nutans, Beiss.

This is another minute form originating in Messrs. Den Ouden's nurseries. Its branches are few and ascending with decurving tips. Side branchlets are few and scattered. The leaves are very irregular in shape, size, arrangement, and distribution. Portions of a branchlet will have leaves mostly up to $\frac{7}{16}$ inch long on one side and about $\frac{3}{16}$ inch on the other, both pointed and obtuse. Other portions of the same branchlet are apparently bare, but on close examination will be found to be covered with minute, extremely narrow, heath-like leaves tightly appressed to the branchlet for almost their entire length and barely $\frac{1}{8}$ inch long. A most distinct and interesting form, making a dwarf and very open-growing bush.

T. baccata, var. compacta, Beiss.

This is the third dwarf form produced by Messrs. Den Ouden's nurseries, freer-growing than the other two, and making a compact oval or conical bush of ascending branches. Not unlike var. *conica nana* in appearance, but much smaller in every way. Leaves $\frac{1}{2}$ to $\frac{7}{16}$ inch long, recurving and fairly broad, arranged radially, very dark shining green.

T. baccata, var. nana, Knight ("Syn. Conif.," p. 52, 1850) (not W. Paul, Bean, or Dallimore).

Syn.: *T. Foxii*, Carr. ("Conif.," i. 519, 1855; Gord., "Pinetum," 391, 1875; Beiss., 174, 1909).

A very dwarf slow-growing form which originated in England; rather open and straggly in habit.

Branches.—Few, irregular, ascending, and rather stiff.

Leaves.—Very short, thick, and variable in shape; some sickle-shaped; much darker than the type; highly

glazed and sometimes red-brown at the tips. There is an old specimen in Glasnevin Botanic Gardens—a low pyramidal bush of very open growth, about 2 feet 6 inches high and about the same through.

This form is now rare in cultivation; it is extremely slow-growing, rarely exceeding 3 feet in height; it is the earliest form described under the name of *nana*, which name, therefore, it must retain to the exclusion of others. Carrière states (ii. 735) that it has lost much of its character from the propagation of its strongest shoots, which have a tendency to spread and raise themselves. On the mother plant the leaves were very short and rarely falcate; on propagated plants they are longer and narrower.

T. baccata, var. Cheshuntensis.

Syn.: var. *nana*, W. Paul (Gord., "Pinetum," ii. 391, 1878) (not Knight, Bean, or Dallimore).

A dwarf, dense, compact conical bush with leaves darker, more glossy green, and occasionally longer than the type, and at times bronzy-brown in colour.

Branches and Branchlets.—Regular, fairly thick, and all ascending at a narrow angle.

Leaves.—Radial on the branches and most of the branchlets; semi-radial to pectinate on a few branchlets.

There is a specimen of this form at Aldenham House, Elstree, Herts, which, Mr. Vicary Gibbs informs me, was obtained from Barbier of Orleans about 1912. It is now 4 feet by 3 feet. This is the second form in cultivation found under the name of var. *nana*, but as its claim to the name is not as old as that of var. *nana*, Knight, a new name had to be found for it. It was raised in Paul's Nurseries at Cheshunt, but is no longer obtainable there.

T. baccata, var. expansa, Carr. ("Conif.," ii. 738, 1867).

A low shrub with widely ramified branches spreading horizontally.

This description seems to fit a third form found in gardens under the name of var. *nana*.

T. baccata, var. *nana*, Bean and Dallimore (not Knight or Paul).

A plant so named at Glasnevin is of semi-procumbent habit with branches spreading horizontally; a very low-spreading bush, about 6 feet through, which fruits freely. This is obviously not var. *nana* of Knight, nor var. *nana* of W. Paul, and it seems very near to, if not identical with, the above-described var. *expansa*, Carr. I have found no other form in cultivation as var. *expansa*, and in the circumstances I would suggest recognising this form as var. *expansa*; otherwise some other name must be supplied for it, as it cannot retain the name of *nana*, which by priority belongs to var. *nana*, Knight. Bean (ii. 581, 1916) and Dallimore, in "Hollies and Yews," both identify var. *nana* with a bush of "spreading habit," so I conclude that this must be the form grown at Kew as var. *nana*.

T. baccata, var. *epacroides*, Beiss. (ii. 53).

A fairly compact bushy form with leaves very short—about $\frac{1}{2}$ inch; thin and narrow—about $\frac{1}{18}$ inch wide. The branches are thin and irregular, and the branchlets occur in irregular whorls at intervals up the branches; the branchlets in such whorls being of various lengths and mostly ascending at an extremely narrow angle. At Aldenham House, Elstree, Herts, there is a plant of this form—a loose, irregular bush about fifteen years old, 4 feet by 3 feet.

T. baccata (?), var. *repandens*, Hort.

Syn.: *T. cuspidata repandens*, Hort.

A low, almost prostrate form of densely radiating branches. Foliage dark glossy green, variable in length; mostly long and sickle-shaped, standing upright on the

branchlets, leaving only a very narrow V-shaped depression between the two ranks of leaves. Winter buds round, with loose, rather humped bud scales.

A form of uncertain origin, usually sent out as a variety of *T. cuspidata*, which it is not. Professor Sargent informs me that he considers it to be a form of *T. baccata*, and that he grows it in the Arnold Arboretum. If this form is hardy in Eastern North America, it is interesting, as *T. baccata* is not generally hardy there, and it is worth considering whether, instead of assigning this form to *T. baccata*, it should not rather be assigned to *T. Canadensis*, Willd. (?). The distinctions between the two species are very slight, but *T. Canadensis* is undoubtedly hardy in Massachusetts, and the hardiness of this form, together with its dwarf spreading habit and loose-scaled winter buds, point rather to *T. Canadensis* than to *T. baccata*.

T. cuspidata, Sieb. and Zucc. ("Fl. Jap.," t. 128).

The Japanese yew is now generally recognised as a separate species; its leaves taper more abruptly, and are yellower underneath than those of *baccata*, and there are other differences in the buds; the type sometimes becomes arborescent, throwing up a single leader.

Leaves about $\frac{3}{4}$ inch long by about $\frac{1}{12}$ inch wide.

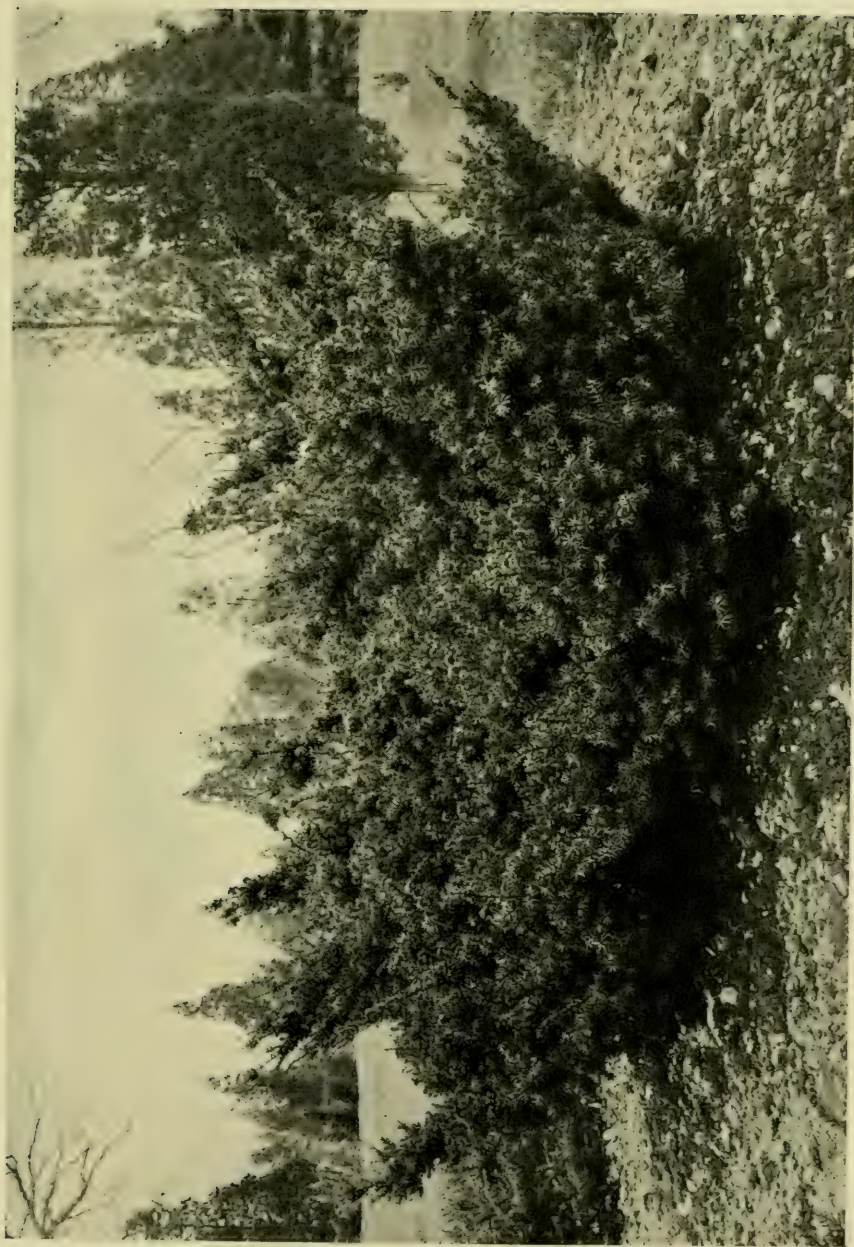
At other times, instead of a leader, it forms a low wide bush; it is then known as var. *capitata*. This is a male form.

T. cuspidata, var. *nana*, Rehder (Bailey, "Cycl. Am. Hort.," iv., 1773, 1902).

Syn.: var. *brevifolia*, Hort.

var. *compacta*, Bean (ii. 582).

This is a widespreading form which does not grow more than 3 to 4 feet high, but, according to Sargent, at times spreads to 15 to 20 feet across. There is a fine and very old specimen of this in the Arnold Arboretum.



TAXUS CUSPIDATA, VAR. NANA, AT ARNOLD ARBORETUM.



TAXUS CUSPIDATA, VAR. DENSE AT ARNOLD ARBORETUM

T. cuspidata, var. *pygmæa*.

A minute narrowly oval bushling, with tightly compressed ascending branches and branchlets, and leaves shorter than the type.

I have a specimen about 1 foot by 9 inches through.

T. cuspidata, var. *densa*, Rehder (Bailey, "Standard Cycl. Hort.," vi., 3316, 1916).

A very dwarf form of extreme rarity, of which I have only young plants. There is a good specimen of this form in the Arnold Arboretum, where it has made a very compact round-topped bush, and Professor Sargent has kindly given me its history. The Arboretum specimen was obtained many years ago from the S. B. Parsons Nursery in Flushing, Long Island, and is believed to have been imported direct from Japan by that firm. Professor Sargent has only come across four plants of this form, and informs me that Wilson did not meet with it in Japan. It is considered to be one of the handsomest of all the dwarf conifers in the Arboretum.

THUYA, Tourn.**Thuya occidentalis**, L. (1753).

Syn.: *T. odorata*, Marsh (1785).

The American *Arbor vitæ* has been cultivated in Europe for over 400 years, so it is not surprising that the number of its seedling variations and sports is exceptionally large. Coming as it does from Eastern North America, from the St. Lawrence to Virginia and North Carolina, it is exceptionally hardy, and would be indispensable in cold climates were it not for its habit of changing its colour in winter from green to a rusty brown. This greatly detracts from its value as an ornamental tree, but fortunately in some of its varieties this change is not so marked, and in others it is absent. The leaves of the

Arbor vitæ emit a strong pungent odour when crushed, or even when held in the hand.

Beissner enumerates fifty-five varieties of this thuya, and there are others in American lists which he had not seen. A great many interesting forms have been raised in the Arnold Arboretum, some of which have already found their way into cultivation in Europe, but not many of the dwarf forms seem to be obtainable in commerce, and some of those we get are obviously not true; for instance, E. H. Wilson, in the *American Garden Magazine* (September 20, 1920), classes var. "*Tom Thumb*" as one of the best dwarf forms, but Beissner (ii. 503) makes this a synonym of var. *Elwangeriana*, which latter form Bean accurately describes as a "tall, lanky, inelegant shrub." Furthermore many of the forms seem to be either very inadequately described, or else show very little distinct variation from one another, and in such descriptions as exist, there is often no mention of the ultimate size attained by particular forms; it is more than possible, therefore, that among the varieties described there will be some included that may eventually grow too tall, and others may have been omitted in error.

T. occidentalis, var. minima.

A slow-growing form; branches, branchlets, and foliage thin and stunted. Habit open and irregular, forming eventually an upright, rather narrowly pyramidal bush of ascending branches, few in number, and set rather far apart. My best specimen, an old plant, is about 3 feet high by 18 inches through. The branchlet sprays, which are slightly recurving, are crowded, at the end of the branchlet forming little tufts about 2 inches by 2½ inches across. The leaves are small and very thin and flat.

This form is distinguishable from var. *plicata pygmæa* by the branches being arranged as in the type, and not set edgeways; its leaves are thinner and flatter, and their glands not nearly so prominent.

T. occidentalis, var. **Ohlendorffii**, Beiss. ("Hand.," 1887, 28).

Syn.: var. *Späthii*, P. Smith.

A most distinct form, the foliage being partly juvenile and partly adult. The awl-shaped juvenile foliage predominates, and occasionally some of the adult foliage must be cut out, otherwise the plant becomes unshapely. The two kinds of foliage grow out of the same branch. Many of the branches are unusually long, straight, and stiff, and bare of side branches except at their tops. The juvenile foliage of these erect branches is stout, broad, awl-shaped, and about $\frac{1}{2}$ inch long, the leaves being arranged in opposite pairs, and are recurved except at their tips (which are incurved).

The scale-like foliage is minute—under $\frac{1}{10}$ inch—the leaves being closely appressed to the branchlet, which in this case is four-sided.

Beissner (ii. 503) states that Ohlendorff cultivated this form in Hamburg before it was named after Späth, and for this reason named this variety var. *Ohlendorffii*; but it has been known in cultivation for many years as var. *Späthii*.

It forms a slow-growing, but somewhat irregular, narrow, globular bush.

T. occidentalis, var. **lutea nana**, Beiss. (ii. 507).

Beissner describes this as a dwarf form of var. *lutea*, which is a narrow pyramidal shrub with typical foliage; green-yellow in summer and deep yellow in winter. I have not seen this dwarf form.

T. occidentalis, var. **Douglasi pyramidalis**, Späth (Beiss. ii. 509).

A compact form raised in the Arnold Arboretum, with crowded fern-like branchlets, the branchlet tips being sometimes cockscomb-like; not unlike *Cupressus obtusa filicoides*. The foliage is dark green with lighter tips.

Pendulous Forms:

There are several pendulous forms of *T. occidentalis*. One in the Rock Garden at Curragh Grange, Co. Kildare, has a low stem of about 3 feet high, from which extend long, almost horizontal branches with pendulous branchlets. This is probably var. *pendula*, Beiss. (ii. 507). There is said to be a variety of this with grey-green foliage, called var. *glauca*. Var. *reflexa*, Beiss. (ii. 508) seems similar to this.

T. occidentalis, var. *ericoides*, Kent (Veitch, "Conif.," 1881-1900; Beiss., "Nad.," 1894-1909).

Syn.: *T. ericoides*, Hort.

T. orientalis, var. *ericoides*, Bean ("Trees and Shrubs," ii. 587).

Retinospora dubia, Carr. ("Conif.," ii., 141, 1867).

R. ericoides, Hort. (not Zucc.).

R. juniperoides, Gordon (ii. 564) (not Carr.).

Branches.—Erectly spreading, much divided, and compact.

Branchlets.—Slender, flexible, more or less erect; dense and very numerous.

Leaves.—Heath-like; linear; spreading distantly; borne in opposite pairs; upper side flat, lower slightly round; acute point; yellow-green in summer and dirty brown in winter. Irregular in direction, mostly pointing up, but some out or down. *Leaf tips inclined to incurve*. A small dense compact pyramidal bush, seldom 3 to 4 feet. This is the juvenile form of *T. occidentalis*.

There has been great confusion in the naming of this plant. Masters took it to be a juvenile form of *T. orientalis*, and so described it in the Kew hand list, and Bean followed Masters.

Kent and Beissner, on the other hand, identified it as a variety of *T. occidentalis*, and I have no doubt but that they were right.

There are two indisputed juvenile forms of *T. orientalis* in general cultivation—namely, vars. *juniperoides* and *Rosedalis compacta*. In both of these the leaves are borne in opposite pairs, and are perfectly regular in arrangement and direction, being wide apart and pointing outwards at rather a wide angle, *with their tips inclined to recurve, and not to incurve*. In colour the juvenile forms of *T. orientalis* are bluish in summer and inclined to turn a glaucous plum colour in winter. They have no very distinct or pungent odour.

Of *T. occidentalis* there is no indisputed purely juvenile form, but there is an indisputed intermediate form—var. *Elwangeriana aurea*—which bears juvenile foliage in a young state and adult foliage on its upper branches. The adult foliage has a strong *Arbor vitæ* smell; most of the juvenile foliage has no smell that would distinguish it from juvenile forms of *T. orientalis*, but upon a few branchlets which bear both juvenile and adult foliage some of the former has a very faint *Arbor vitæ* odour when crushed, and, speaking generally of juvenile forms, very little is to be learned from their smell.

But when the foliage of this indisputed form of *T. occidentalis*—var. *Elwangeriana aurea*—is compared with that of the two indisputed forms of *T. orientalis*, and with that of the disputed *T. occidentalis ericoides*, it at once becomes apparent that the juvenile foliage of *T. occidentalis*, instead of being regular, widespread, and tending to *recurve* like that of *T. orientalis*, is irregular, mostly ascending, and tending to *incurve* in a manner exactly similar to that of the disputed *T. occidentalis ericoides*, and also to that of "*T. Watereri*" of gardens (*q.v.*).

When, added to the similarity in the arrangement of foliage, it is also observed that its colour changes in winter to that dirty brown-green shade that *T. occidentalis* (type) becomes, and not the attractive plum colour that forms of *T. orientalis* become, I think that there can be

very little further doubt but that Kent and Beissner's identification is right, and that the so-called *T. orientalis ericoides* of Masters and Bean is in reality *T. occidentalis ericoides*; as a corollary, "*T. Watereri*," Hort., must also be *T. occidentalis Watereri*.

T. occidentalis ericoides forma *Watereri*.

A form growing at Gowran Castle, Co. Kilkenny, and at Blandsfort, Queen's Co., under the name of "*T. Watereri*"; its origin is unknown, but growing at the former place twenty-five to thirty years, anyhow. It is a juvenile state of the same type as *T. occidentalis*, var. *ericoides*, but is distinct from that in size of leaf and habit. No juvenile form appears in A. Waterer's catalogue of 1875, nor in his present one, nor does he know anything about it, and in J. Waterer's only "*Retinospora ericoides*" appears. The catalogue does not state whether this var. *ericoides* is of Zucc. or Hort, but in any case var. *Watereri* is neither of these.

It makes a low bush of several leading plumose shoots, none of which appear able to support themselves, and flop about; the branches and branchlets are all ascending and remarkably thin and fine. A normal branchlet grows about 3 inches annually, but being so fine and unable to hold itself erect, it contracts by a series of curves or spirals into a length of about 2 inches, and is light yellow-green in colour in summer and the usual dirty yellow-brown in winter. Leaves very thin, and set about $\frac{1}{4}$ inch apart in opposite pairs, mostly minute— $\frac{1}{16}$ inch and $\frac{1}{8}$ inch—but a few, usually in middle of branchlet, up to $\frac{3}{8}$ inch. Lower side slightly convex and minutely keeled; upper side slightly rounded with median groove. Irregular in direction—some point forward with incurved tips, others outward with straight or even recurved tips; very narrow, thin, fine, and heath-like, tapering to a fine point.

A curious plumose form of var. *ericoides*.

T. occidentalis, var. **Ellwangeriana**, Beiss. (ii. 305).

Syn.: var. "*Tom Thumb*," Beiss. (not Wilson).

An intermediate form bearing both juvenile and scale-like foliage, the latter usually predominating, and, if the form in cultivation in Europe is true, forming eventually a broad, lanky pyramidal bush up to 5 to 6 feet in height.

Beissner makes it synonymous with var. "*Tom Thumb*," but specimen branches of the latter form which I received from the Arnold Arboretum are much smaller and finer, and appear to be entirely adult foliage.

T. occidentalis, var. **Ellwangeriana aurea**, Späth ("Mitt. d. d. d. Ges.," 1896, 28).

Syn.: var. *Hoveyi aurea*, Hort. aliq.

Beissner (ii. 503) states that this form was raised by Späth of Berlin. With me it forms a slow-growing compact pyramid of bright golden-yellow.

Branchlets ascending, the branchlet spray being about 4 inches long by 2 inches wide. Young plants bear mostly juvenile foliage, but as the plants grow the juvenile foliage becomes less and less.

This and the following form are a wonderful colour, especially in winter, when most thuyas are a dirty brown.

T. occidentalis, var. **Ellwangeriana** "**Rheingold**," Vallert. ("Mitt. d. d. d. Ges.," 1904, 10).

This, according to Beissner (ii. 503), is simply a brighter form of the foregoing raised by Vallert of Lubeck, but plants of various sizes that I have received under this name bear only adult foliage. It is somewhat brighter in colour, and its branchlet sprays are rather wider and slightly curved.

T. occidentalis, var. **plicata**, Masters (*Gard. Chron.*, 1897, 758).

With rigid branches arranged in a vertical plane, like those of *T. orientalis*; a roundish bushy plant. This is possibly too large for inclusion.

T. occidentalis, var. *plicata pygmæa*, Beiss. (ii. 504).

Syn.: var. *pygmæa*, Rehder.

A small irregular bush which requires occasional pruning to keep it in shape.

Branches arranged as in var. *plicata*. Branchlets crowded, short and stout, with the sprays overlapping. Leaves very crowded, short and stout—much thicker than those of any other dwarf form of this thuya. Colour very shining green; branchlet tips sometimes brown. Colour varies very slightly winter or summer. The leaves are very glandular.

Of this Beissner mentions (ii. 504) golden and silver variegated forms, which I have not seen, nor can I find them in cultivation.

T. occidentalis, var. *plicata dumosa*, Hort.

Syn.: *T. occidentalis plicata Llaveana*, Hort.

T. occidentalis nana, Carr. ("Man. des Plantes," iv. 323).

Carrière describes this as having very crowded, spreading branches, short and diffuse. Branchlets fan-shaped, rather stout and short, disposed in different directions. Forming a compact, roundish column, sometimes flat on top, and is distinguished by the quantity of tiny branchlets, which grow upon and practically conceal the main stem. It does not exceed 30 inches in height.

T. occidentalis, var. *Wareana*, Beiss. (ii. 504).

A densely branched compact pyramid with broad fan-shaped branches and short thick branchlets; the branches are vertical; foliage is bright green. Raised by Thomas Ware, of Coventry, about 1850.

Beissner records (ii. 505) coloured varieties of this form under the names of var. *Wareana lutescens*, Hesse, and var. *Wareana aureo-variegata*, Späth; also a densely branched compact globular form—var. *Wareana globosa*, Beiss., which I have not seen.

T. occidentalis, var. **Hollandica** ("Mitt. d. d. d. Ges.," 1904, 139), and var. **Boothi**.

Are compact pyramidal forms not very distinct.

T. occidentalis, var. **Douglasi**, Rehder.

Syn.: var. *filiformis*, Beiss.

I have not seen this, but from Beissner's description (ii. 508) it seems to resemble *Chamaecyparis pisifera filifera* in habit and foliage. He says nothing of its ultimate height.

T. occidentalis, var. **Bodmeri**, Hort. (Beiss., ii. 508).

An upright form not unlike *Cupressus obtusa*, var. *lycopodioides*, in general appearance.

Branches and branchlets ascending and irregular. Foliage dark green; thick, short, and very crowded; the small scale-like leaves being in groups of four to the branchlet, and having their sides appressed. Very distinct. Fairly common in cultivation.

There is a plant of this form at Curragh Grange, Co. Kildare, 4 feet by 3 feet.

T. occidentalis, var. **recurva nana**, Hort. (Beiss., ii. 509).

A roundish conical form with very crowded ascending branches and recurving branchlets.

T. occidentalis, var. **cristata**, Hort. (Beiss., ii. 509).

An irregular dwarf form, with short, thick spreading branches surmounted by curious cockscomb-like, rather thin, fan-shaped branchlets. The sprays have an annual growth of from 2 to 3 inches, and are frequently twisted; the minute scale-like foliage is closely appressed to the branchlets, which are round rather than flat.

A curious form of which Beissner ("Mitt. d. d. d. Ges.," 1904, 135) records a golden variegated variety—var. *cristata aurea*.

T. Occidentalis, var. **compacta**, Beiss. (ii. 509).

Syn.: var. *globularis*, Lamb.

var. *nana*, Hort.

var. *Spihlmanni*, P. Smith.

var. *Froebelli*, Hort.

Possibly the best known of the dwarf forms; a compact ball of fresh green foliage; branchlets crowded and somewhat twisted. Short and stout. Ultimate growth about 5 feet in diameter, the branchlet sprays being about 3 inches long by 4 inches across.

A plant of this form at Curragh Grange is now about 4 feet 6 inches by 4 feet 6 inches.

T. occidentalis, var. globosa, Beiss.

Syn.: var. *Little Gem*, Hort.

A somewhat similar form, but smaller and finer in every respect; the branchlet sprays being about 3 inches long by 2½ inches across; the whole forming a small compact ball.

T. occidentalis, var. Hoveyi, Beiss. (ii. 510).

I do not know the origin of this form. Beissner describes it as a broad stumpy form with dark green Biota-like foliage. The form usually grown under this name is a slow-growing broad pyramid of typical foliage of a rather yellow-green, and not very attractive.

T. occidentalis, var. umbraculifera (Möll., "D. Gartnerz," 1891, 179; Beiss., ii. 510).

Raised by Christopher Neder in Frankfort-on-Main; a very desirable form.

Branches ascending; branchlets twisted and slightly decumbent, the branchlet sprays being about 6 inches by 2 inches.

Foliage thin, fine, and dark green.

The whole forming a low bush, narrow at the base, with a wide cushion-shaped head raised in the centre, and not unlike an umbrella.

Beissner records the size of the original plant in 1909 as being about 2 feet 6 inches high by 3 feet across the top. My best specimen is about 2 feet by 2 feet 3 inches.

T. occidentalis, var. cæspitosa.

A tiny form which I found in Glasnevin Botanic Gardens; origin unknown. The smallest form I have seen.

Branches, branchlets, and foliage short and very thick; like those of var. *minima*, but branchlet sprays only 2 inches long by 1 inch across, and growing erect, but forming a very low, rather flat-topped cushion about 9 inches high by 15 inches across.

This plant has been growing in Glasnevin for over fifteen years.

T. occidentalis, vars. **Woodwardi** and “**Tom Thumb**” and **Reedii**.

Are recorded by E. H. Wilson (*Garden Magazine*, September, 1920, p. 38) as being good dwarf forms without further description.

T. orientalis, Linnæus (1753).

Syn.: *Biota orientalis*, Endl. (1847).

The Chinese *Arbor vitæ* was introduced into Europe about 1750, and a form of the type—a broadly conical or beehive-shaped shrub—is a common feature in lawn planting; this form, indeed, and its golden-foliaged counterpart, grow so slowly that they may be admitted into small gardens. The type is easily recognisable from its branchlet sprays being set edgeways to the plant and both sides being of the same colour. Coming as it does from North China, Turkistan, and Formosa, one would expect it to be exceptionally hardy, but while tolerant of frost, it seems somewhat tender to biting winds and also dislikes drought.

T. orientalis, var. **meldensis**, Masters (*Journ. Roy. Hort. Soc.*, xiv. 253, 1892).

Syn.: *Biota orientalis*, var. *meldensis*, Laws. ex Carr. (“*Conif.*,” ii. 102).

A shrub, narrowly pyramidal, or round and obtuse, very compact. Branches spreading, semi-erect or deflexed. Branchlets and sprays very numerous and crowded. Leaves opposite, linear, pointed, semi-juvenile, or intermediate; glaucous green in summer, violet-red in winter. If scale-like leaves appear they are appressed.

This is the intermediate form of *T. orientalis*, as var. *Elwangeriana* is of *T. occidentalis*.

Carrière notes that this plant is affected by climate, old specimens at Meux retaining all their characteristics, while on similar plants at Hyères scale-like leaves predominated.

This interesting form was raised from seed of *T. orientalis* collected in 1852 in the cemetery of Trelbardon, near Meux, France, and was raised by Monsieur Athanase Cauchoise. It was for some time the subject of controversy, and was supposed to be a hybrid of the thuya and *Juniperus Virginiana* which was growing beside it.

T. orientalis, var. juniperoides, Ascherson and Graeb.
("Fl.," i. 241, 1897).

Syn.: *Retinospora juniperoides*, Carr. ("Conif.," 2nd ed., 140, 1867).

R. rigida, Carr. (MSS.).

R. decurvata, Hort.

R. squarrosa, Hort. (not Zucc.).

Juniperus ericoides, Hort.

Cupressus ericoides, Hort.

Chamæcyparis decussata, Hort.

Biota orientalis decussata, Beiss. and Hochst.
(i. 58, 1891).

Frenela glauca, Hort (not Mirb.).

Carrière describes this as a very bushy shrub, forming a wide, short, compact column roundly obtuse on top. Branches semi-erect, very crowded. Branchlets and sprays excessively numerous (almost touching), erect, cylindrical. Leaves acicular, opposite, decussate, spreading almost at right angles. About 6 to 10 mm. in length, stiff, persistent a long time. Glauous or bluish-green in colour. Upper side flat or slightly concave; thick and roundish below, marked with two very narrow glaucous lines, sometimes barely observable. Enlarged at the base, tapering regularly to apex, which is stiff and sharp-pointed. Japan (?). Introduced 1852. Very hardy.

To this full description of Carrière's I have little to add. One point to be noted is that, in common with all other

juvenile forms of *T. orientalis*, the tips of its leaves are inclined to recurve, and not, like those of *T. occidentalis*, to incurve.

Beissner states ("Nadel," ii. 520) that in winter its foliage changes to brownish-violet or steel blue in colour. In the mild climate of Ireland this change is not perceptible, nor does Carrière refer to it. Possibly in the greater cold of the German winter this change of colour takes place. Vars. *Rosedalis*, *meldensis*, and *minima glauca* all change colour in any climate.

This is the fixed juvenile form of *T. orientalis*, as var. *ericoides* is of *T. occidentalis*, and it is now very rare in cultivation. It is easily propagated from cuttings, and deserves wide cultivation on account of its beautiful glaucous colour. There is much confusion about its name. It was originally exhibited at the French International Horticultural Exhibition of 1852 as *Juniperus ericoides*, but was first described by Carrière in 1867 as *Retinospora juniperoides*. For this reason I prefer to retain Carrière's name of var. *juniperoides* to that of Beissner—"var. *decussata*"—under which it is now, but rarely, found. This form is so rare in the British Isles that there is no specimen of it at present at the Botanic Gardens of Kew, Glasnevin, or Edinburgh. There is a fine specimen, however, at Rostrevor, purchased by Sir John Ross, of Bladensburg, from Veitch about twenty-five years ago, and now nearly 4 feet in height. The plant at Kew grown under the name of "var. *decussata*" is possibly var. *intermedia*, Carr. ("Man. des Plantes," v. 322).

***T. orientalis*, var. *nana*, Carr.** ("Conif.," ii. 94, 1867).

Syn.: var. *compacta*, Beiss.

An extremely compact dwarf form, having its spray in the vertical plane similar to the type, and forming a broad, roundish, beehive-shaped bush, of ascending branches and bright green adult foliage.

This form has long been cultivated in Japanese gardens;

it is very slow-growing and keeps its shape well. I have a specimen 4 feet by 3 feet.

Beissner records (ii. 523) two sub-varieties of this: var. *Ungeri* ("Mitt. d. d. d. Ges.," 1904, 87), found by Herr Alfred Unger in Osaka, Japan—a similar form but with the young shoots tipped with white; and var. *articulata*, a compact globular form with finer and longer branchlets.

T. orientalis, var. aurea.

A slow-growing form of the type with golden foliage may be included, but in time may grow too large.

T. orientalis, var. falcata, Veitch.

Syn.: *Biota orientalis falcata*, Carr. ("Conif.," ii. 96; Beiss., ii. 528).

Found by J. G. Veitch in Yokohama. A small irregular form of upright ascending pyramidal growth, with wide-spreading branches and branchlets, and dark green sickle-shaped branchlet sprays. Leaves scale-like, remote at the apex, very deep green.

T. orientalis, var. monstrosa, Carr. ("Conif.," i. 95, 1855).

Syn.: *T. Siberica monstrosa*, Knight, ex Gord. ("Pinetum," Sup. 18).

An irregular bush of short, gross branchlets, few in number, and much contorted, frequently four-sided from the thickened obtuse ovate (rarely acute) leaves. Leaves scale-like, distant, shortly oval.

A distinct variety, frequently covered with a mass of young shoots like "witches'-broom."

T. orientalis, var. cristata, Carr. ("Conif.," ii. 97, 1867).

A compact small plant of upright growth; its branches are short, erect, and crowded, and are surmounted by crowded cockscomb-like growths of branchlets, which are frequently twisted. This variety was found by Monsieur A. Sénéclauze (Carr.).

T. orientalis, var. **triangularis**, Gordon ("Pinetum," 1875, p. 55).

A curious dwarf compact variety with branchlets arranged in a triangular manner, and not as usual—flat or fan-shaped.

T. orientalis, var. **pumila argentea** of Veitch.

A tiny form which seems lost to general cultivation. Foliage tiny and scale-like, not unlike that of var. *filiformis*. Branchlets all ascending, forming a small ball about 8 inches through on a bare stem 9 inches high. Branchlet tips all splashed with white.

Such at least is the plant grown under this name for many years at Glasnevin. I have never seen it elsewhere. It was purchased from Veitch.

T. orientalis, var. **Athrotaxoides**, Carr. (*Rev. Hort.*, 1861, 229; "Mitt. d. d. d. Ges.," 1894, 17).

Syn.: var. *dacrydioides*, Rovelli ("Mitt. d. d. d. Ges.," 1904, 87).

T. occidentalis, var. *Athrotaxoides*, Hort } By
T. occidentalis, var. *Defresneana*, Hort } mis-
Cupressa obtusa, var. *Athrotaxoides*, Hort } take.

A form very similar to *Cupressus obtusa*, var. *lycophodioides*, but less bloated in appearance, the thick dull yellow-green stems and foliage being slighter and more regular in size; the whole making a fairly compact, globular or pyramidal bush. There is one at Glasnevin, a pyramidal shrub 5 feet by 3 feet.

According to Carrière, this form was raised from seed of *T. orientalis*, var. *compacta*, and of the resulting seedlings about eight resembled the parent, and about six were more or less monstrous forms, one of which is the above.

T. orientalis, var. **dumosa**, Carr. ("Conif.," ii. 96, 1867).

Syn.: var. *antarctica*, Hort;

var. *pygmæa*, Hort. (not Veitch).

A broad compact dwarf bush, with bluish foliage and short crowded branchlets, compressed and disposed fan-wise. Leaves scale-like, crowded, thick and stumpy; obtuse apex; appressed for the whole of their length.

Beissner says this is more like a form of *T. occidentalis* than *T. orientalis*. Carrière states that it was raised in America, and he suggests that it may be a connecting link between *T. occidentalis* and *T. orientalis*.

***T. orientalis*, var. *densa glauca*, Beiss. (ii. 526).**

A pretty, densely branched blue-green dwarf, of roundish shape, with foliage similar to var. *nana*.

***T. orientalis*, var. *minima glauca*.**

The smallest form, a tiny globular bush of juvenile foliage, similar in appearance to vars. *Meldensis* or *Chamæcyparis spherioidea ericoides*.

Extremely slow-growing. Annual growth of fine heath-like ascending branches, $\frac{1}{4}$ to $\frac{3}{4}$ inch only.

Foliage glaucous green in summer, yellow-brown in winter. My best specimen, planted ten to twelve years, is still only a few inches high and as much through.

***T. orientalis*, var. *Rosedalis compacta*.**

A juvenile form, and the most beautiful of all; branches, branchlets, and foliage finer and more heath-like than var. *juni-peroides*. Growth very crowded. Annual growth of branchlets 1 inch to 3 inches; the branches and branchlets are so fine and filmy that it is necessary to tie a piece of fine string around the plant to hold it in shape.

It makes a shapely ovoid bush and changes colour three times a year. First in early spring the young growth comes out a brilliant golden-yellow; as the season advances this gradually disappears from base to crown, changing to a glaucous pale sea-green. Then in winter the whole plant becomes a glaucous plum colour, almost indescribably beautiful. I got this form originally from Chenault, of Orleans, and do not know its origin, but it is certainly a

most beautiful plant; it, however, dislikes cutting winds or hot suns, and desires a sheltered situation.

My best specimen is now 2 feet 10 inches by 2 feet.

T. orientalis, var. **filiformis**, Henk. and Hochst., and **forma stricta**.

Syn.: *Biota pendula stricta*, Endl.

One of the most distinct forms, but not one of the most beautiful. Normal foliage is entirely absent, being replaced by elongated branchlets covered with narrow appressed scale-like foliage similar to *Chamaecyparis pisifera*, var. *filifera*. In var. *filiformis* the branches are pendulous; in the form *stricta* the branches are erect, being maintained in a shapely round head by the denseness of their growth. The leaves are minute, in opposite pairs, and have long decurrent bases, their tips only being free.

Colour yellow-green; not very hardy, and dislikes cold spring winds.

My best specimen is a good-sized globular bush about 3 feet by 3 feet. In the form *tetragona* the plant makes a rounder bush, nearer in shape to var. *orientalis aurea*. The leaves are ascending and sharp-pointed; the branches are tetragonal.

T. orientalis, var. **intermedia**, Masters (Kas. Hand-list, "Conif.," 57, 1903).

Syn.: *Biota orientalis intermedia*, Carr. ("Man. des Plantes," 322) (not Gord.).

Biota pendula, Endl., var. *intermedia*, Hort.

A vigorous, diffuse shrub. Branches very wide-spreading. Branchlets lengthened, cylindrical, pendent. Leaves scale-like, opposite, decussate; swollen and decurrent at base, more or less loose at apex. Mucronate; pointed; distant on branches and branchlets, closer on sprays; long, persistent. This variety is indistinct, although related to var. *pendula*.

Carrière states that at Huber and Co.'s Nurseries at Hyères it made round and compact bushes.

T. orientalis, var. *cupressoides*, Masters (*Journ. Roy. Hort. Soc.*, xiv. 253, 1892).

Syn.: *Biota orientalis cupressoides*, Carr. ("Conif.," ii. 97).

Carrière describes this as having branches short, erect, fastigiate. Branchlets and sprays short and spreading, the plant recalling *Cupressus fastigiata*. It was raised by Monsieur A. Sénéclauze.

T. plicata, Don.

Of the Western American thuya, known also as *T. gigantea* and *Lobbi*, there is only one dwarf form in cultivation.

T. plicata, var. *Hillieri*.

Branches very short, stout and thick. Young branchlets green to red-brown, thick and stiff. Growth irregular; small branches and branchlets produced in crowded whorls all over main stem, and principal branches forming a congested mass with occasional long branches, shooting out at various angles to main stem, but all more or less ascending. The spray on these stronger branches is pyramidal in shape, and about 5 inches long by 5 inches at its widest part. Foliage bright glaucous green, stout and flattened.

Raised in Hillier's Nurseries at Winchester. A very irregular bush with foliage so dense that one wonders how light or moisture can ever penetrate into its centre. I have a plant of this form about fifteen years old, an irregular bush with obtruding branches about 4 feet by 4 feet.

T. Lobbi, var. *pumila*, Smith ("Pl. Fir Tribe," 46, 187?).

Syn.: *T. plicata*, var. *pumila*, Sudworth.

T. Lobbi is an old garden name for *T. plicata*, Don, and a plant under the name of *T. Lobbi*, var. *pumila*, appears in an old catalogue of R. Smith, of Worcester, dated 1875.

In the absence of any description, I cannot say to what extent it differs from Hillier's plant.

THUYOPSIS.

Thuyopsis dolabrata, Sieb.

Is closely allied to the thuyas. In Japan a shrub, or a tree of up to 40 feet in height. In most parts of the British Isles it forms a pyramidal shrub. Its flat branchlets and appressed leaves are very distinct. It was introduced by J. G. Veitch in 1861.

T. dolabrata, var. **nana**, Sieb. and Zucc.

Syn.: *T. laetevirens*, Lindl.

Hime-asunaro (Jap.).

A compact, spreading, flat-topped dwarf bush rarely reaching 2 feet in height. Branches, branchlets, and leaves about half the size of the type.

Branchlets.—Annual growth about 1 inch to 1½ inches.

Leaves.—Very appressed, flat and fine, about $\frac{1}{16}$ inch, retaining their colour in winter better than the type.

A very distinct, slow-growing dwarf form introduced from Japan by J. G. Veitch in 1861 (Beiss., ii. 489).

A very fine specimen—forty years old—in the R.H.S. Gardens at Wisley is now under 2 feet in height and about 8 feet in diameter. At Kilmacurragh, Co. Wicklow, is another 3 feet 6 inches by 8 feet; age unknown.

T. dolabrata, var. **cristata**, Beiss. (ii. 489); and “Mitt. d. d. d. Ges.,” 1902, 72).

A compact, conical plant with stout, broadly fan-shaped ascending branches, very crowded, twisted, and cockscomb-like.

Beissner states that this form was raised from seed at Ansorge's Nursery at Flottbek, near Hamburg.

TORREYA.

Torreya nucifera, Sieb., var. **prostrata**.

The torreyas are allied to the yews and to *Cephalotaxus*. *T. nucifera* in Japan is a tree from 20 to 80 feet high: in European cultivation it rarely exceeds the dimensions

of a shrub. In Glasnevin Botanic Gardens, Dublin, are two old specimens planted as seedlings: one is of normal growth—an upright shrub or small tree, 12 or 15 feet high; the other has made an almost prostrate mat under 3 feet high and about 15 feet through.

TSUGA, Carr.

The hemlock firs, with the exception of the Eastern North American *Tsuga Canadensis*, Carr., have not supplied us with many dwarf forms, but one of the species—*Ts. diversifolia*, Masters, grows so slowly in Europe and eventually makes so small a shrub, that it can be safely grown in small gardens. The one dwarf form of *Ts. Carolimana*, Engl., originated in the Arnold Arboretum. So far no dwarf form of *Ts. Albertiana*, Sen. (syns.: *Ts. Mertensiana*, Carr., and *T. heterophylla*, Sargt.), has been found, nor any of the remaining Japanese and Chinese tsugas (*Ts. Sieboldi*, var. *nana*, hort., seems to be only *Ts. diversifolia* in disguise); but of *Ts. Pattoniana*, Engl. (syns.: *Ts. Hookeriana*, Carr., and *Ts. Mertensiana*, Sargt.), I had some interesting seedlings. They were collected for me as seedlings on the mountains in Vancouver Island about thirteen years ago, and I judged them to be four years, or more, of age at that time. The majority of them were normal *Ts. Pattoniana*, and of these I kept only one, which is now about 8 to 10 feet high and very glaucous, but two young plants which appeared to be abnormal I also retained. One of these has since turned out to be a natural hybrid between *Ts. Pattoniana* and *Ts. Albertiana*; it is absolutely intermediate, and is making a strong, healthy tree. Professor A. Henry has named this one *Ts. Jeffreyi*, and has described it elsewhere. The remaining form is *Ts. Pattoniana* (type), and very glaucous, but so far it promises to retain a dwarf habit.

Under exactly the same conditions as the larger seedling

already referred to, this plant has grown into a small dense pyramid only some 2 feet high. It is apparently perfectly healthy, but makes almost inappreciable growth yearly. I hesitate, however, to class it as a true dwarf form as yet.

Tsuga Canadensis, Carr.—Of this *tsuga* Beissner records several dwarf forms, but only three distinct forms seem to be in cultivation:

Ts. Canadensis, var. *nana*, Carr. ("Conif.," i. 190).

Syn.: var. *minima*, Hort.

Buds.—Minute.

Branches.—Mostly horizontal and widespreading.

Branchlets.—Thin, stiff, and sparse.

Leaves.—About half the size of the type; yellow-green above and pale whitey-green beneath.

A shrub of irregular, open growth; unattractive on account of the colour of its foliage.

Ts. Canadensis, var. *parvifolia*, P. Smith (Beiss., ii. 403).

Syn.: var. *microphylla*, Hort.

Buds.—Minute and dark.

Branches.—Ascending and arching.

Branchlets.—Fine, not stiff; tips slightly pendulous.

Leaves.—About one-third size of the type; dark green above, very blue-green beneath.

A much more effective plant than the former, making a dense bush of arching branches, the colour of the foliage being very attractive.

Ts. Canadensis, var. *Sargentii pendula*, Bean ("Trees and Shrubs," ii. 606).

Syn.: var. *pendula*, Beiss.

Bean separates these two varieties, but Professor Sargent informs me that the nurserymen's stock has all been produced from grafts from the four original plants found near the summit of Fishkill Mountain (near Beacon City, on the Hudson River) by General Joseph Howland

about 1870. The finder grew one in his own garden at Matteawan, N.Y., gave the second to Mr. Henry Winthrop Sargent, of Fishkill; the third to Mr. H. H. Hunnewell, of Wellesley, Mass.; and the fourth to Professor C. S. Sargent, of Brookline, Boston. The second and third are dead, but the first and fourth have made very fine specimens. Grafted plants in general cultivation vary considerably, some being dwarfer and more compact than others. The best form makes a very compact hemispherical mass of pendulous branches.

Another dwarf pendulous form appeared as a seedling at Wellesley; it has made a low, broadly conical bush of pendulous branches, and at present is about 4 feet high by as much through.

Beissner records in addition:

Ts. Canadensis, var. compacta nana, Beiss. (ii. 402).

A densely branched, close-growing, low dwarf form, with smaller leaves than var. *nana*.

Ts. Canadensis, var. globosa, Beiss. (ii. 402).

A handsome round, regular globose form, neither stiff nor stunted, with nodding branch tips.

Ts. Canadensis, var. pumila, Ordnung. (Beiss., ii. 89).

A form at Eisenberg, in Bohemia; a rather crowded branched dwarf conical form with nodding branch tops and drooping branchlet tips.

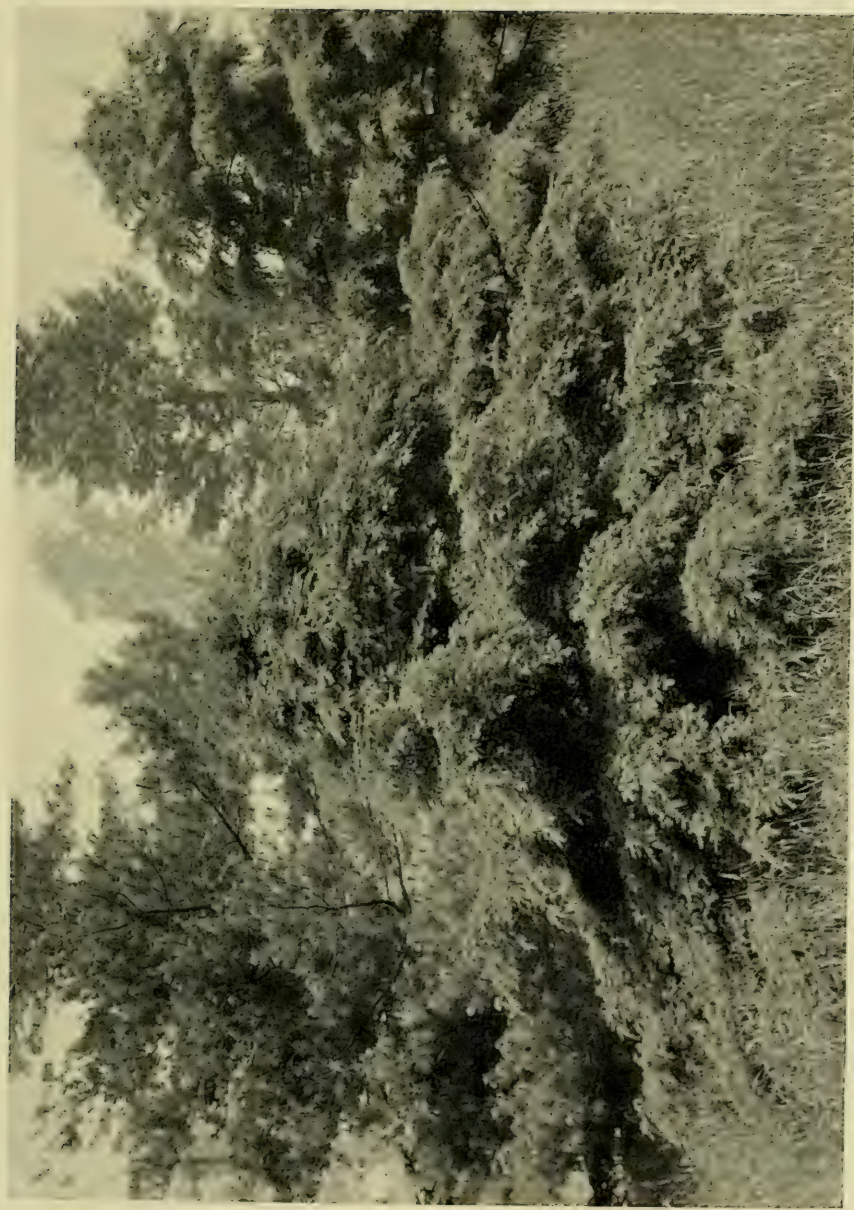
The plant at ten years old was 60 cm. high by as much through.

Ts. Canadensis, var. sparsifolia, Beiss. (ii. 89).

A compact bush, with ascending branches and short irregular branches thinly covered with very small leaves, having the general appearance of a juniper.

Ts. Caroliniana, var. compacta.

Amongst the seedlings of *Ts. Caroliniana* raised at the Arnold Arboretum in 1881, one displayed a dense slow-



TSUGA CAROLINIANA, VAR. COMPACTA, AT ARNOLD ARBORETUM.

growing habit. This habit it has retained, but Professor C. S. Sargent informs me that with age it is increasing in vigour. From a photograph it appears as a low and very dense bush about 10 feet high and about 12 feet through, round-topped, with branches in horizontal layers. Professor Sargent regards it as the handsomest dwarf conifer in his collection.

INDEX

(All synonyms are set in italics, and the number on the left-hand side of each synonym corresponds with that of the variety of which it is synonymous.)

	PAGE		PAGE
Abies		Abies—continued	
— <i>amabilis</i> , Forb.	17	23. — <i>sibirica</i> , <i>monstrosa</i> , Schroeder	25
1. — — <i>compacta</i>	17	24. — — <i>nana</i> , Schroeder	25
— <i>balsamea</i> , Mill.	18	25. — — <i>pendula</i> , Schroeder	25
3. — — <i>globosa nana</i> , Hort.	18	26. — — <i>pumila</i> , Schroeder	25
2. — — <i>Hudsonica</i> , Sargt.	18	— <i>subalpina</i> , Endl. See A. <i>lasiocarpa</i> , 21	
3. — — <i>nana</i> , Beiss.	18	Biota , Endl. See <i>Thuya</i> <i>Orientalis</i> .	
4. — — <i>prostrata</i> , Knight and Carr.	19	— <i>orientalis</i> , Endl.	175
— <i>concolor</i> , Lindl.	20	431. — — <i>compacta</i> , Beiss.	177
5. — — <i>compacta glauca</i>	20	441. — — <i>decussata</i> , Beiss.	176
6. — — <i>globosa</i> , Niemitz	20	436. — — <i>falcata</i> , Carr.	178
7. — — <i>pendula</i> , Simon-Louis	20	442. — — <i>meldensis</i> , Laws.	175
8. — — <i>violacea compacta</i> , Beiss.	20	444. — — <i>monstrosa</i> , Carr.	178
— <i>grandis</i> , Lindl.	21	445. — — <i>nana</i> , Carr.	177
9. — — <i>compacta</i> , Hesse	21	Cedrus , Lk.	
10. — — <i>pendula</i> , Späth	21	27. — <i>brevifolia</i> , Henry	26
2. — <i>Hudsoni</i> , Carr.	18	29. — <i>Comte de Dijon</i> , Carr.	25
— <i>lasiocarpa</i> , Nutt.	21	— <i>Deodara</i> , Loud.	27
4. — — <i>Arizonica</i> , Lem.	21	28. — — <i>pendula</i> , Beiss.	27
11. — — <i>Beissneri</i> , Hesse	22	— <i>Libani</i> , Lk.	25
12. — — <i>compacta</i> , Rehder	21	27. — — — <i>brevifolia</i> , Hook	26
13. — — <i>compacta</i> , Beiss.	22	29. — — <i>Comte de Dijon</i> , Barbier	25
13. — — <i>conica</i>	21	29. — — <i>nana</i> , Loud.	25
— <i>Nordmanniana</i> , Lk.	22	30. — — <i>nana pyramidata</i> , Carr.	25
14. — — <i>brevifolia</i> , Carr.	23	31. — — <i>pendula</i> , Knight	26
15. — — <i>pendula</i> , Hort. and Beiss.	23	32. — — <i>pendula</i> Sargenti, Hort.	26
— <i>pectinata</i> , D.C.	23	Cephalotaxus	
16. — — <i>brevifolia</i> , Carr.	23	— <i>pedunculata</i> , Sieb.	27
17. — — <i>compacta</i> , Beiss.	23	33. — — <i>fastigiata</i> , Carr.	27
18. — — <i>pendula</i> , Beiss.	23	34. — — — <i>aureo variegata</i> , Beiss.	27
19. — — <i>nana</i> , Hort.	23	35. — — <i>nana compacta</i> , Froeb.	27
19. — — <i>prostrata</i> , Hort.	23	36. — — <i>prostrata</i>	27
19. — — <i>pumila</i> , Hort.	23	Chamæcyparis	
19. — — <i>tortusa</i> , Booth	23	37A. — <i>Bourseri</i> , Carr.	28
— <i>Pinsapo</i> , Boiss.	24	441. — <i>decussata</i> , Hort.	176
20. — — <i>Hammondi</i> , Veitch	24	119. — <i>ericoides</i> , Carr.	53
21. — — <i>pyramidata</i> , Beiss.	24	37A — <i>Lawsoniana</i> , Parl.	28
— <i>sibirica</i> , Ledeb.	24		
22. — — <i>compacta glauca</i> , Beiss.	25		

	PAGE
Chamæcyparis—continued	
37. — <i>Lawsoniana</i> , compacta nova, Beiss.	36
38. — — <i>conica</i> , Beiss.	32
39. — — <i>Darleyensis aurea</i> , Kent	32
40. — — <i>ericoides</i> , Kent	33
45. — — <i>ericoides</i> , Hort.	34
41. — — <i>filiformis compacta</i> , Hort.	28
42. — — <i>Fletcheri</i>	31
43. — — <i>Forsteckiana</i> , Beiss.	37
44. — — <i>gracilis nana</i> , Beiss.	36
53. — — <i>intermedia</i> , Hort.	28
45. — — <i>juniperoides</i> , Kent.	34
46. — — <i>Krameri</i> , Hort.	36
47. — — <i>Knowefieldensis</i>	34
48. — — <i>lycopodioides</i> , Tott.	35
49. — — <i>Milfordensis</i>	33
50. — — <i>minima</i> , Gord.	29
51. — — — <i>glauca</i>	29
52. — — — <i>argentea</i>	30
53. — — <i>nana</i> , Gord.	28
54. — — — <i>albo spicata</i> , Beiss.	29
55. — — — — <i>maculata</i> , Hort.	29
55. — — — — <i>variegata</i> , Beiss.	29
56. — — — <i>argentea</i> , Beiss.	30
57. — — — <i>glauca</i>	29
58. — — — <i>nidiformis</i>	30
58. — — — <i>plumosa nidifera nana</i>	30
59. — — — <i>prostrata glauca</i> , Beiss.	31
53. — — — <i>pumila</i>	28
60. — — — <i>pygmæa argentea</i> , Beiss.	30
61. — — — <i>Raievskyana</i> , Lieb.	37
62. — — — <i>Shawii</i> , Beiss.	36
63. — — — <i>Squarrosa</i> , Mayr	33
64. — — — — <i>nana aurea</i>	33
65. — — — <i>tamariscifolia</i>	31
66. — — — <i>Weisseana</i> , Beiss.	37
38. — — — <i>Wisselii</i> , Hort.	32
118. — — <i>Leptoclada</i> , Hochst.	54
67A — — <i>Nutkænsis</i> , Spach.	38
67. — — — <i>compacta</i> , Beiss.	38
69. — — — <i>compressa</i> , Hort.	39
68. — — — <i>ericoides</i> , Beiss.	38
69. — — — <i>gracilis</i> , Beiss.	39
58. — — — <i>nidiformis</i> , Hort.	30
70A — — <i>Obtusa</i> , Sieb. and Zucc.	39
70. — — — <i>Aonokujahuhiba</i> , Onuma	46
71. — — — <i>cæspitosa</i>	44
72. — — — <i>compacta</i> , Beiss.	40
91. — — — <i>ericoides</i> , Böhmer	41

	PAGE
Chamæcyparis—continued	
73. — — <i>Obtusa</i> , filicoides, Regel	46
74. — — — <i>aurea</i>	46
75. — — — <i>juniperoides</i>	44
76. — — — <i>lycopodioides</i> , Carr.	45
77. — — — — <i>aurea</i>	45
78. — — — — <i>Coralliformis</i> , Hort. (Jap.)	46
79. — — — — <i>Kanaamihiba</i> , Hort. (Jap.)	46
80. — — — — <i>Rashahiba</i> , Hort. (Jap.)	46
81. — — — — <i>Shamohiba</i> , Hort. (Jap.)	46
82. — — — <i>Mariesii</i>	41
94. — — — <i>minima densa</i>	43
84. — — — <i>nana</i> , Carr.	40
85. — — — — <i>albo variegata</i> , Beiss.	41
86. — — — — <i>aurea</i>	40
87. — — — — <i>densa</i>	40
87. — — — — <i>gracilis</i> , Beiss.	40
88. — — — — <i>prostrata</i>	42
89. — — — <i>pygmæa</i> , Carr.	39
90. — — — — <i>aureo variegata</i> , Beiss.	41
94. — — — <i>pygmæa</i> , Rogers	43
92. — — — <i>Tetragona</i> , Barron	42
93. — — — — <i>aurea</i> , Gord.	43
94. — — — — <i>minima</i>	43
95. — — — <i>Troubetz Koyana</i> , Beiss.	45
96A — — <i>Pisifera</i> , Sieb. and Zucc.	47
96. — — — <i>aurea nana</i>	48
97. — — — — <i>ericoides</i> , Regel	52
98. — — — — <i>filifera</i> , Beiss.	47
99. — — — — <i>aurea</i>	47
100. — — — — <i>flava</i> , Schelle	47
101. — — — — <i>nana</i> , Hesse	47
102. — — — — <i>nana</i> , Beiss.	51
103. — — — — <i>aureo variegata</i>	48
104. — — — — <i>aurea</i> , Beiss.	48
105. — — — — <i>plumosa</i>	50
106. — — — — <i>albo spica</i>	50
107. — — — — <i>argentea</i>	50
108. — — — — <i>aurea</i>	50
109. — — — — — <i>compacta</i>	51
110. — — — — — <i>aurescens</i>	51
111. — — — — — <i>aurea nana</i>	51
112. — — — — — <i>cristata</i> , Onuma	51
113. — — — — — <i>flavescens</i>	50
114. — — — — <i>Squarrosa</i> , Beiss. and Hochst	48
115. — — — — — <i>dumosa</i> , Beiss.	49

	PAGE
Chamæcyparis—continued	
116. — <i>Pisifera, squarrosa, inter-</i> <i>media</i> ..	49
114. — — — <i>leptoclada</i> , Endl. ..	48
116A — — — <i>minima</i> ..	49
116. — — — <i>pygmæa</i> ..	49
117. — — — <i>sulphurea</i> ..	48
118A — <i>Sphæroidea</i> , Spach. ..	53
118. — — <i>Andelyensis</i> , Carr. ..	54
119. — — <i>ericoides</i> , Beiss. and Hochst ..	53
120. — — — <i>glauca</i> ..	53
121. — — <i>Hoveyii</i> , Beiss. ..	55
118. — — <i>leptoclada</i> , Hort. ..	54
114. — — <i>leptoclada</i> , Zucc. and Endl. ..	48
122. — — <i>nana</i> , Endl. ..	55
123. — — <i>pygmæa</i> , Carr. ..	55
Cryptomeria	
124A — <i>Japonica</i> , Don ..	55
124. — — <i>compacta</i> , Beiss. ..	56
125. — — <i>cristata</i> , Beiss. ..	57
126. — — <i>elegans nana</i> , Beiss. ..	58
127. — — <i>globosa nana</i> ..	58
131. — — <i>lycopodioides</i> , Beiss. ..	56
125. — — <i>monstrosa</i> , Hort. ..	57
128. — — <i>nana</i> , Knight ..	56
129. — — — <i>albo spicata</i> ..	56
128. — — <i>pygmæa</i> , Knight ..	56
131. — — <i>Selaginoides</i> , Hort. ..	56
130. — — <i>spiralis</i> , Sieb. and Zucc. ..	57
130. — — <i>spiraliter falcata</i> , Sieb. ..	57
131. — — <i>Viminalis</i> ..	56
Cupressus	
119. — <i>ericoides</i> , Kent. ..	53
132A — <i>Macrocarpa</i> , Hart. ..	59
132. — — <i>compacta</i> ..	59
133. — — <i>Crippsii</i> , Bean. ..	59
134. — <i>Sempervirens fastigiata</i> Fortuselli, Carr. ..	59
135. — — — <i>monstrosa</i> , Carr. ..	59
— <i>thyoides</i> , L. See <i>Chamæ-</i> <i>cyparis Sphæroidea</i> ..	53
136. — <i>Torulosa</i> , Don, var. <i>nana</i> , Gord. ..	60
For other cypress species, see under <i>Chamæcyparis</i> .	

Juniperus

162. — <i>alpina</i> , Clus. ..	68
164. — <i>Canadensis</i> , Lodd. ..	68

	PAGE
Juniperus—continued	
165. — <i>Canadensis, aurea</i> ..	68
137A — <i>Chinensis</i> , L. ..	61
137. — — <i>albo variegata</i> , Hort. ..	63
138. — — <i>aurea</i> , Young ..	61
139. — — <i>decumbens</i> ..	64
140. — — — <i>albo variegata</i> ..	66
141. — — — <i>aureo variegata</i> ..	66
142. — — <i>globosa</i> , Sargt. ..	62
143. — — — <i>aurea</i> ..	62
144. — — — <i>cinerea</i> ..	62
145. — — <i>nana</i> , Hochst. ..	67
146. — — <i>pendula</i> , Beiss. ..	61
147. — — — <i>aurea</i> ..	61
148. — — — <i>monstrosa</i> ..	61
149. — — <i>Pfitzeriana</i> , Späth ..	61
150. — — <i>plumosa</i> ..	66
151. — — — <i>aurea</i> ..	66
171. — — <i>procumbens</i> , Endl. ..	74
150. — — — <i>aurea</i> , Beiss. ..	66
141. — — — <i>aureo variegata</i> , Beiss. ..	66
153. — — <i>pyramidalis</i> ..	67
154. — — <i>Sargentii</i> , Henry ..	63
155. — — <i>Sheppardii</i> ..	62
156. — — <i>Umbraculifera</i> ..	67
138. — — <i>Youngi</i> , Hort. ..	61
157A — <i>Communis</i> , L. ..	67
157. — — <i>aurea</i> ..	72
162. — — <i>alpina</i> , Gord. ..	68
163. — — — <i>aurea</i> ..	68
158. — — <i>compressa</i> , Carr. ..	70
159. — — <i>depressa</i> ..	68
160. — — <i>echinæformis</i> , Beiss. ..	71
167. — — <i>hemispherica</i> , Parl. ..	72
158. — — <i>hibernica compressa</i> , Carr. ..	70
161. — — <i>Jackii</i> , Rehder ..	72
162. — — <i>nana</i> , Loud. ..	68
163. — — — <i>aurea</i> ..	72
164. — — — <i>canadensis</i> ..	68
165. — — — <i>aurea</i> ..	68
166. — — <i>prostrata</i> ..	68
158. — <i>Compressa</i> , Rinz. ..	70
169. — <i>Conferta</i> , Parl. ..	73
119. — <i>ericoides</i> , Nois. ..	53
137. — <i>Fortuni</i> , Hort. ..	63
167. — <i>hemispherica</i> , Presl. ..	72
158. — <i>hibernica compressa</i> , Lodd. ..	70
158. — <i>Hispanica</i> , Presl. ..	70
168. — <i>horizontalis</i> , Mönch. ..	76
168. — <i>Hudsonica</i> , Forb. ..	76

	PAGE
Juniperus—continued	
139. — <i>Japonica</i> , Carr. ..	64
140. — — <i>albo variegata</i> , Hort.	66
141. — — <i>aureo variegata</i> , Hort.	66
151. — — <i>aurea</i> , Hort. ..	66
153. — — <i>pyramidalis</i> , Carr. ..	67
169. — <i>litoralis</i> , Maxim. ..	73
162. — <i>nana</i> , Willd. ..	68
164. — — <i>canadensis</i> , Carr. ..	68
165. — — — <i>aurea</i>	68
167. — — <i>hemispherica</i> , Carr. ..	72
160. — <i>Oxycedrus echinæformis</i> , Knight	71
171. — <i>procumbens</i> , Sieb. ..	74
168. — <i>prostrata</i> , Pers. ..	76
172. — <i>recurva densa</i> , Carr. ..	74
182. — — <i>squamata</i> , Hook. ..	76
173A — <i>Sabina</i> , L. ..	75
173. — — <i>cupressifolia</i> , Ait. ..	75
174. — — <i>humilis</i> , Endl. ..	75
175. — — — <i>aureo spicata</i> ..	75
176. — — — Knap Hill ..	75
177. — — — Von Ehren ..	75
168. — — <i>prostrata</i> , Loud. ..	76
178. — — <i>tamariscifolia</i> , Ait. ..	75
179. — — — <i>glauca</i>	75
180. — — <i>variegata</i> , Hayne ..	75
191. — <i>Sanderi</i> , Hort. ..	41
155. — <i>Sheppardi</i> , Kent ..	62
155. — <i>Sphærica glauca</i> , Gord. ..	62
182. — <i>Squamata</i> , Hamil. ..	76
183. — — <i>prostrata</i>	77
184A — <i>Virginiana</i> , L. ..	77
184. — — <i>Cannarti</i> , Beiss. ..	77
185. — — <i>dumosa</i> , Carr. ..	77
186. — — <i>globosa</i> , Beiss. ..	78
142. — — <i>globosa</i> , Hort. ..	62
187. — — <i>humilis</i> , Lodd. ..	78
188. — — <i>interrupta</i> , Beiss. ..	77
189. — — <i>Kosteriana</i> , Beiss. ..	77
190. — — <i>monstrosa</i> , Carr. ..	79
191. — — <i>nana compacta</i> , Beiss.	79
192. — — — <i>aurea</i> , Nelson ..	79
193. — — — <i>nivea</i> , Beiss. ..	78
194. — — <i>prostrata</i> , Sargt. ..	77
195. — — <i>reptans</i> , Jen. ..	78
196. — — <i>Schotti</i> , Hort. ..	78
197. — — <i>tripartitia</i> , Hort. ..	78
198. — — — <i>aureo variegata</i> , Beiss.	78
138. — <i>Youngi</i> , Hort. ..	61

	PAGE
Larix	
— <i>dahurica</i> , Turez. ..	79
199. — — <i>prostrata</i> , Regel ..	79
— <i>Europea</i> , D.C.	79
200. — — <i>cervicornis</i> , Beiss. ..	79
201. — — <i>compacta</i>	79
202. — — <i>Kellermanni</i> , Carr. ..	79
203. — — <i>reptans</i> , Willk. ..	79
Picea, Lk.	
— <i>Alba</i> , Lk.	80
204. — — <i>compacta gracilis</i> , Breinig	81
205. — — — <i>pyramidalis</i> , P. Smith	81
206. — — <i>compressa</i> , Beiss. ..	81
207. — — <i>echinæformis</i> , Carr. ..	81
208. — — <i>nana</i> , Carr. ..	80
209. — — — <i>glauca</i>	80
210. — — <i>pendula</i> , Carr. ..	81
— <i>Albertiana</i> , Stew. Brown ..	82
211. — — <i>conica</i> , Rehder ..	82
211A — <i>Aurantiaca</i> , Hunnewell- liana	83
— <i>Canadensis</i> , Brit. See P. Alba	83
— <i>Engelmanni</i> , Engl. ..	83
212. — — <i>microphylla</i> , Hesse ..	83
— <i>Excelsa</i> , Lk.	83
213. — — <i>archangelica</i> , Hort. ..	118
214. — — <i>brevifolia</i> , Cripps ..	88
215. — — <i>brevifolia argentea</i> ..	89
216. — — <i>capitata</i> , Croux ..	105
217. — — <i>cellensis</i> , Schiebler ..	122
218. — — <i>Clanbrasiliiana</i> , Carr. ..	90
219. — — — <i>elegans</i> , Sénécl. ..	93
220. — — — <i>plumosa</i> , Beiss. ..	94
221. — — — <i>stricta</i> , Loud. ..	92
222. — — — <i>compacta</i>	122
223. — — — <i>Arselyn</i>	122
224. — — <i>conica</i> , Carr. ..	103
225. — — — <i>elegans</i>	103
226. — — <i>compressa</i> , Schw. ..	122
227. — — <i>decumbens</i>	116
228. — — <i>diffusa</i>	120
272. — — <i>dumettorum</i> , Hort. ..	124
229. — — <i>dumosa</i> , Carr. ..	111
227. — — <i>dumosa</i> , Hort. ..	116
216. — — <i>dumosa</i> , Hort. Kew ..	105
230. — — <i>echinæformis</i> , Beiss. ..	108
238. — — <i>echinæformis</i> , Hort. ..	108
231. — — <i>elegans</i>	103
232. — — <i>Ellwangeriana</i> ..	106
233. — — <i>globosa</i> , Berg. ..	99

PAGE

Picea, Lk.—*continued*

261.	—	<i>Excelsa, globosa nana,</i>	
		Hort.	99
234.	—	<i>Gregoriana, Gord.</i>	96
235.	—	<i>Parsonsii</i>	98
236.	—	<i>Veitchii</i>	97
237.	—	<i>humilis</i>	99
238.	—	<i>hystrix</i>	108
239.	—	<i>inversa</i>	109
240.	—	<i>Knaptonensis</i>	95
241.	—	<i>Maxwelli, Maxwell</i>	103
257.	—	<i>Maxwelli, Hort.</i>	105
241A	—	<i>Maxwelli, Beiss.</i>	103
242.	—	<i>Merkii, Beiss.</i>	109
243.	—	<i>microsperma, Mast.</i>	116
244.	—	<i>mucronata, Carr.</i>	114
257.	—	<i>mucronata, Hort.</i>	108
245.	—	<i>Nana, Carr.</i>	117
214.	—	<i>nana, Beiss.</i>	88
246.	—	<i>nidiformis, Beiss.</i>	101
247.	—	<i>Ohlendorffii, Späth</i>	118
248.	—	<i>pachyphylla</i>	102
249.	—	<i>parviformis</i>	121
250.	—	<i>pendula, Beiss.</i>	109
251.	—	<i>— major</i>	109
252.	—	<i>— monstrosa</i>	109
253.	—	<i>Petröwskoensis,</i>	
		Schr.	122
254.	—	<i>phylicoides, Carr.</i>	121
255.	—	<i>procumbens, Carr.</i>	111
256.	—	<i>prostrata</i>	112
257.	—	<i>pseudo-Maxwelli</i>	105
215.	—	<i>pumila argentea,</i>	
		Hort.	89
258.	—	<i>pumila, Beiss.</i>	118
259.	—	<i>— glauca</i>	118
260.	—	<i>— nigra</i>	118
261.	—	<i>pygmæa, Carr.</i>	99
218.	—	<i>pygmæa, Hort.</i>	90
262.	—	<i>pyramidalis gracilis</i>	113
263.	—	<i>— reflexa, Carr.</i>	109
264.	—	<i>— repens, Simon Louis</i>	111
265.	—	<i>Remonti, Hort.</i>	107
265A	—	<i>Remonti, Kent</i>	107
266.	—	<i>Sargenti</i>	120
267.	—	<i>Shelesnowii, Schr.</i>	122
268.	—	<i>spathulifolium</i>	121
269.	—	<i>tabulæformis, Carr.</i>	112
		<i>— Mariana, Prel.</i>	See
		<i>Picea Nigra</i>	123
		<i>— Nigra, Lk.</i>	123
270.	—	<i>Doumetii, Carr.</i>	123
271.	—	<i>— ericoides, Bean</i>	124
272.	—	<i>— fastigiata, Carr.</i>	124

PAGE

Picea, Lk.—*continued*

272A	—	<i>Nigra, "Mariana,"</i>	
		Hort.	125
273.	—	<i>nana, Beiss.</i>	125
274.	—	<i>— pendula variegata</i>	124
272.	—	<i>— pumila, Knight</i>	124
		<i>— Orientalis, Lk.</i>	125
275.	—	<i>— gracilis</i>	126
276.	—	<i>— — nana, Hort.</i>	126
276.	—	<i>nana, Carr.</i>	126
277.	—	<i>— pygmæa glauca</i>	126
247.	—	<i>pygmæa, Hort.</i>	118
		<i>— Parryana Bar. See Picea</i>	
		<i>Pungens</i>	126
		<i>— Pungens, Engl.</i>	126
278.	—	<i>— Compacta, Rehder</i>	127
278A	—	<i>— Hunnewelliana</i>	128
279.	—	<i>— pendula Kosteri</i>	127
280.	—	<i>— prostrata</i>	127
		<i>— Retroflexa</i>	129
284.	—	<i>— nana</i>	129
		<i>— Rubra, Lk.</i>	129
281.	—	<i>— crista-galli</i>	129
		<i>— rubens, Sargt. See Picea</i>	
		<i>Rubra</i>	129
		<i>— Schrenkiana, F. and M.</i>	130
282.	—	<i>— globosa, Schelle</i>	130
		<i>— Sitchensis, Carr.</i>	131
283.	—	<i>— microphylla</i>	131
		Pinus, L.	
		<i>— Cembra, L.</i>	139
316.	—	<i>— nana, Hort.</i>	139
316.	—	<i>— pumila, Pall.</i>	139
285.	—	<i>— pygmæa, Carr.</i>	139
285A	—	<i>Cembroides, Zucc. (sport)</i>	131
		<i>— densiflora, Sieb. and</i>	
		<i>Zucc.</i>	133
286.	—	<i>— asamensis, Beiss.</i>	133
287.	—	<i>— globosa</i>	133
288.	—	<i>— pendula, Mayr</i>	133
289.	—	<i>— aurea, Beiss.</i>	133
290.	—	<i>— tabulæformis, Carr.</i>	133
291.	—	<i>— umbraculifera, Mayr</i>	133
292.	—	<i>— Bandaisho</i>	133
293.	—	<i>— — Tanyosho</i>	133
		<i>— Excelsa, Wall.</i>	134
294.	—	<i>— nana, R. Smith</i>	134
		<i>— halepensis, Mill.</i>	136
295.	—	<i>— rotundata, Carr.</i>	136
		<i>— Laricio, Poir.</i>	134
296.	—	<i>— Balcanica, Velen.</i>	134
297.	—	<i>— Bujoti, Carr.</i>	135
303.	—	<i>— leucodermis, Koch.</i>	137

	PAGE
Pinus, L.—continued	
298. — <i>Laricio monstrosa</i> , Beiss.	135
299. — — <i>Moseri</i> , Beiss.	.. 135
302. — — <i>nana</i> , Hort.	.. 135
300. — — <i>prostrata</i> , Beiss.	.. 135
301. — — <i>pumila aurea</i>..	.. 135
302. — — <i>pygmæa</i> , Rauch	.. 135
303. — — <i>leucodermis</i> , Ant.	.. 137
— <i>Massoniana</i> , Sieb. (not Lamb.)	.. 137
304. — — <i>tabulæformis</i> , Sieb.	.. 133
305. — — <i>Montana</i> , Mill.	.. 136
306. — — <i>Mughus</i>	.. 136
307. — — <i>pumilio</i>	.. 136
— <i>parviflora</i> , Sieb. and Zucc.	.. 138
308. — — <i>glauca</i>	.. 138
309. — — <i>brevifolia</i> , Beiss.	.. 138
310. — — <i>nana</i> , Beiss.	.. 139
311. — — <i>oculis draconis</i> , Mayr	139
312. — — <i>tortusa</i> , Mayr	.. 139
313. — — <i>variegata</i> , Mayr	.. 139
— <i>pentaphylla</i> , Mayr	.. 139
314. — — <i>brevifolia</i> , Mayr	.. 139
315. — — <i>tortusa</i> , Mayr	.. 139
315A — <i>Pinaster</i> , Sol., var. <i>minor</i> , Loisl.	.. 137
316. — <i>pumila</i> , Regel	.. 139
316. — — <i>pygmæa</i> , Fisch.	.. 139
— <i>Resinosa</i> , Sol.	.. 137
317. — — <i>globosa</i> , Rehder.	.. 137
— <i>Sylvestris</i> , L.	.. 144
318. — — <i>argentea</i>	.. 144
319. — — <i>argentea compacta</i> , Ordnusig.	.. 144
320. — — <i>aurea</i> , Kent	.. 147
321. — — <i>Beauvronensis</i> , Tran- son	.. 144
297. — — <i>Bujoti</i> , Hort.	.. 135
322. — — <i>compressa</i> , Carr.	.. 144
323. — — <i>fastigiata</i> , Carr.	.. 144
324. — — <i>Genevensis</i> , Beiss.	.. 146
327. — — <i>globosa nana</i> , Hort.	.. 145
325. — — <i>nana</i> , Carr.	.. 146
326. — — <i>pumila</i> , Beiss.	.. 144
327. — — <i>pygmæa</i> , Beiss.	.. 145
328. — — <i>pyramidalis com- pacta</i>	.. 147
329. — — <i>Saxatilis</i> , Carr.	.. 148
330. — — <i>Tabulæformis</i> , Hort.	145
331. — — <i>Umbraculifera</i> , Beiss.	145
332. — — <i>Viridis compacta</i> , Hort.	.. 148
333. — — <i>Watereri</i>	.. 144

	PAGE
Pinus, L.—continued	
— <i>Strobis</i> , L.	.. 141
334. — — <i>brevifolia</i> , Loud.	.. 141
334. — — <i>compressa</i> , Booth	.. 141
335. — — <i>minima</i>	.. 143
336. — — <i>nana</i> , Carr.	.. 141
337. — — <i>nana</i> , Hort.	.. 142
338. — — <i>pendula</i>	.. 144
339. — — <i>prostrata</i> , Rehder	.. 143
340. — — <i>pumila</i>	.. 143
336. — — <i>pygmæa</i>	.. 141
— — <i>radiata</i>	.. 142
342. — — <i>tabulæformis</i>	.. 142
341. — — <i>Umbraculifera</i> , Hort.	.. 142
342. — — <i>Umbraculifera</i> , Beiss.	142
304. — <i>Tabulæformis</i> , Carr. (not Hort.)	.. 133
342. — <i>Tabulæformis</i> , Hort. (not Carr.)	.. 142
— <i>Thunbergii</i> , Parl.	.. 137
343. — — <i>globosa</i> , Mayr	.. 138
344. — — <i>pendula</i> , Mayr	.. 138
345. — — <i>tortusa</i> , Mayr	.. 138

Podocarpus

346. — <i>Alpina</i> , R. Brown	.. 148
347. — <i>Andina</i> , Poepp. (not Hort.)	.. 149
349. — <i>Andina</i> , Hort. (not Poepp.)	.. 149
347. — <i>Chilina</i> , Rich.	.. 149
348. — <i>Totara</i>	.. 149

Prumnopitys

349. — <i>elegans</i> , Philippi	.. 149
----------------------------------	--------

Pseudolarix

— <i>Kaempferi</i> , Gord.	.. 150
350A — — <i>Annesleyana</i>	.. 150
350B — — <i>Dawsoni</i>	.. 150
350C — — <i>nana</i>	.. 150

Pseudotsuga

— <i>Douglasi</i> , Carr.	.. 151
351. — — <i>argenteo compacta</i> , Hans	.. 152
352. — — <i>brevifolia</i> , Mast.	.. 154
353. — — <i>compacta</i> , Beiss.	.. 151
354. — — — <i>glauca</i>	.. 153
355. — — — <i>viridis</i>	.. 153
356. — — <i>dumosa</i> , Carr.	.. 151
357. — — <i>Fletcheri</i>	.. 152
358. — — <i>Fretsii</i>	.. 153
359. — — <i>globosa</i> , Beiss.	.. 153

	PAGE
Pseudotsuga—continued	
360. — <i>Douglasi, globosa</i> , Sargt.	152
361. — — <i>leptophylla</i> ..	154
356. — — <i>monstrosa</i> ..	151
— — <i>pygmæa</i> ..	152
— <i>Glauca</i> , Mayr ..	155
362. — — <i>nana</i> ..	155
363. — — <i>pumila</i> , Beiss. ..	155

Retinospora ..	155
405. — <i>dubia</i> , Carr. ..	168
119. — <i>ericoides</i> , Zucc. ..	53
405. — <i>ericoides</i> , Hort. ..	168
119. — — <i>stricta</i> , Hort. ..	53
73. — <i>filicoides</i> , Veitch. ..	46
98. — <i>filifera</i> , Standish ..	47
441. — <i>Juniperoides</i> , Carr. ..	176
405. — <i>Juniperoides</i> , Gord. ..	168
118. — <i>leptoclada</i> , Gord. ..	54
114. — <i>leptoclada</i> , Zucc. ..	48
76. — <i>lycopodioides</i> , Gord. ..	45
76. — <i>monstrosa</i> , Hort. ..	45
73. — <i>nobleana</i> , Hort. ..	46
70A — <i>obtusa</i> , Sieb. ..	39
96A — <i>pisifera</i> , Sieb. ..	47
91. — <i>Sanderii</i> , Sanders ..	41

Sciadopitys	
364. — <i>verticillata</i> , Sieb. and Zucc. (Japanese dwarf forms) ..	156

Sequoia	
— <i>sempervirens</i> , Endl. ..	156
366. — — <i>pendula nana</i> ..	156

Taxodium	
367. — <i>distichum fasciatum</i> , Carr. ..	157
— <i>sempervirens</i> , Lamb. See <i>Sequoia sempervirens</i>	156

Taxus	
369. — <i>adpressa</i> , Carr. ..	158
— <i>baccata</i> , L. ..	158
368. — — <i>columnaris</i> , Carr. ..	158
369. — — <i>adpressa</i> , Carr. ..	158
370. — — — <i>aurea</i> ..	158
371. — — — <i>aureo variegata</i> ..	158
372. — — — <i>stricta</i> ..	158
373. — — — <i>compressa</i> , Carr. ..	158
374. — — — <i>compacta</i> , Beiss. ..	161
375. — — — <i>Cheshuntensis</i> ..	162
376. — — — <i>epacroides</i> ..	163

	PAGE
Taxus—continued	
377. — <i>baccata, ericoides</i> , Carr.	160
378. — — <i>expansa</i> , Carr. ..	162
382. — — — <i>Foxii</i> , Hort. ..	162
379. — — — <i>gracilis pendula</i>	158
380. — — — <i>horizontalis</i> , Knight	159
381. — — — <i>monstrosa</i> , Carr. ..	160
382. — — — <i>nana</i> , Knight ..	161
375. — — — <i>nana</i> , W. Paul ..	162
378. — — — <i>nana</i> , Bean and Dal- limore ..	163
383. — — — <i>nutans</i> , Beiss. ..	161
384. — — — <i>procumbens</i> , Hort. ..	160
388. — — — <i>procumbens</i> , Loud. ..	164
385. — — — <i>prostrata</i> , Bean ..	159
386. — — — <i>pygmæa</i> , Beiss. ..	160
389. — — — <i>repandens</i> , Hort. ..	164
387. — — — <i>Sieboldi</i> ..	159
369. — <i>brevifolia</i> , (Hort., not Nutt.) ..	158
388. — <i>Canadensis</i> , Willd. ..	164
389. — — <i>repandens</i> ..	164
— <i>Cuspidata</i> , Sieb. and Zucc.	164
392. — — — <i>brevifolia</i> , Hort. ..	164
390. — — — <i>capitata</i> , Hort. ..	164
392. — — — <i>compacta</i> , Bean ..	164
391. — — — <i>densa</i> , Sargt. ..	165
392. — — — <i>nana</i> , Rehder ..	164
393. — — — <i>pygmæa</i> ..	165
389. — — — <i>repandens</i> , Hort. ..	164
377. — <i>empetrifolia</i> , Gord. ..	160
382. — <i>Foxii</i> , Gord. ..	162
377. — <i>microphylla</i> , Hort. ..	160
369. — <i>parvifolia</i> , Wend. ..	158
381. — <i>sparsifolia</i> , Loud. ..	160
369. — <i>tardiva</i> , Lam. ..	158

Thuja	
428. — <i>Defresniana</i> , Hort. ..	179
394. — <i>Lobbi pumila</i> , R. Smith	182
— <i>Occidentalis</i> , L. ..	165
428. — — <i>athrotaxoides</i> , Hort. ..	179
395. — — — <i>Bodmeri</i> ..	173
396. — — — <i>Boothi</i> ..	173
— — — <i>cæspitosa</i> ..	174
397. — — — <i>compacta</i> , Knight ..	173
407. — — — <i>compacta</i> , Hort. ..	174
398. — — — <i>cristata</i> , Beiss. ..	173
399. — — — — <i>aurea</i> ..	173
400. — — — <i>Douglasi</i> , Rehder ..	173
401. — — — — <i>pyramidalis</i> ..	167
402. — — — <i>Ellwangeriana</i> , Beiss. ..	171
403. — — — — <i>aurea</i> , Späth ..	171
404. — — — — <i>Rheingold</i> , Vallert	171

PAGE

Thuya—continued

405. — Occidentalis, ericoides, Kent	168
406. — — — Watereri	168
119. — — — ericoides, Bean	53
407. — — — globosa, Beiss	174
397. — — — globularis, Lamb	173
408. — — — Hollandica	173
409. — — — Hoveyi	174
407. — — — Little Gem	174
411. — — — lutea nana, Beiss.	167
412. — — — minima	166
413. — — — nana, Carr.	166
397. — — — nana, Hort.	173
414. — — — Ohlendorffii, Beiss.	167
415. — — — pendula	168
416. — — — glauca	168
— — — plicata, Mast.	171
417. — — — dumosa, Hort.	172
417A — — — pygmæa	172
418. — — — pygmæa, Rehder	174
419. — — — reflexa	168
420. — — — Reedii	175
414. — — — Späthii, P. Smith	167
397. — — — Spihlmanni, P. Smith	173
421. — — — Tom Thumb, E. H. Wilson	175
402. — — — Tom Thumb, Beiss.	171
422. — — — Umbraculifera	174
— — — Wareana	172
423. — — — aureo variegata, Späth	172
424. — — — Globosa, Beiss.	172
425. — — — lutescens, Hesse	172
426. — — — Woodwardi	175
— — — Orientalis, L.	175
428. — — — athrotaxoides, Carr.	179
429. — — — aurea	178
430. — — — nana	178
431. — — — Compacta Ungerii, Beiss.	174
445. — — — Compacta, Hort.	177
432. — — — cristata, Carr.	178
433. — — — cupressoides, Carr. and Mast.	182
428. — — — dacrydioides, Rovelli	179
441. — — — decussata, Beiss.	176
434. — — — densa glauca, Beiss.	180
435. — — — dumosa, Carr.	179
405. — — — ericoides, Bean	168

PAGE

Thuya—continued

436. — Orientalis, falcata nana, Veitch	178
437. — — — filiformis, Henk.	181
438. — — — stricta	181
439. — — — tetragona	181
440. — — — intermedia, Carr. and Mast.	181
441. — — — juniperoides, Asch.	176
442. — — — meldensis, Mast.	175
443. — — — minima glauca, Beiss.	180
444. — — — monstrosa, Carr.	178
445. — — — nana	177
437. — — — pendula	181
446. — — — pumila argentea	179
435. — — — pygmæa, Hort.	179
447. — — — Rosedalis compacta	180
448. — — — triangularis, Gord.	179
— — — plicata, Don.	182
449. — — — Hillieri	182

Thuyopsis

— dolabrata, Sieb. and Zucc.	183
450. — — Cristata, Ansorge	183
451. — — nana, Sieb. and Zucc.	183
451. — — lætevirens, Lindl.	183

Torreya

451A — nucifera prostrata	183
---------------------------------	-----

Tsuga

— Canadensis, Carr.	185
452. — — compacta nana, Beiss.	186
453. — — globosa, Beiss.	186
455. — — microphylla, Hort.	185
455. — — minima, Hort.	185
454. — — nana, Carr.	185
457. — — pendula, Hort.	185
455. — — parvifolia, P. Smith	185
456. — — pumila, Ordnung.	186
457. — — Sargentii pendula, Beiss	185
458. — Sparsifolia	186
— Caroliniana, Engl.	186
459. — — Compacta	186
460. — — diversifolia	185
— Pattoniana, Engl.	185
461. — — compacta	185
— Sieboldi, Carr.	185
460. — — nana, Carr.	185

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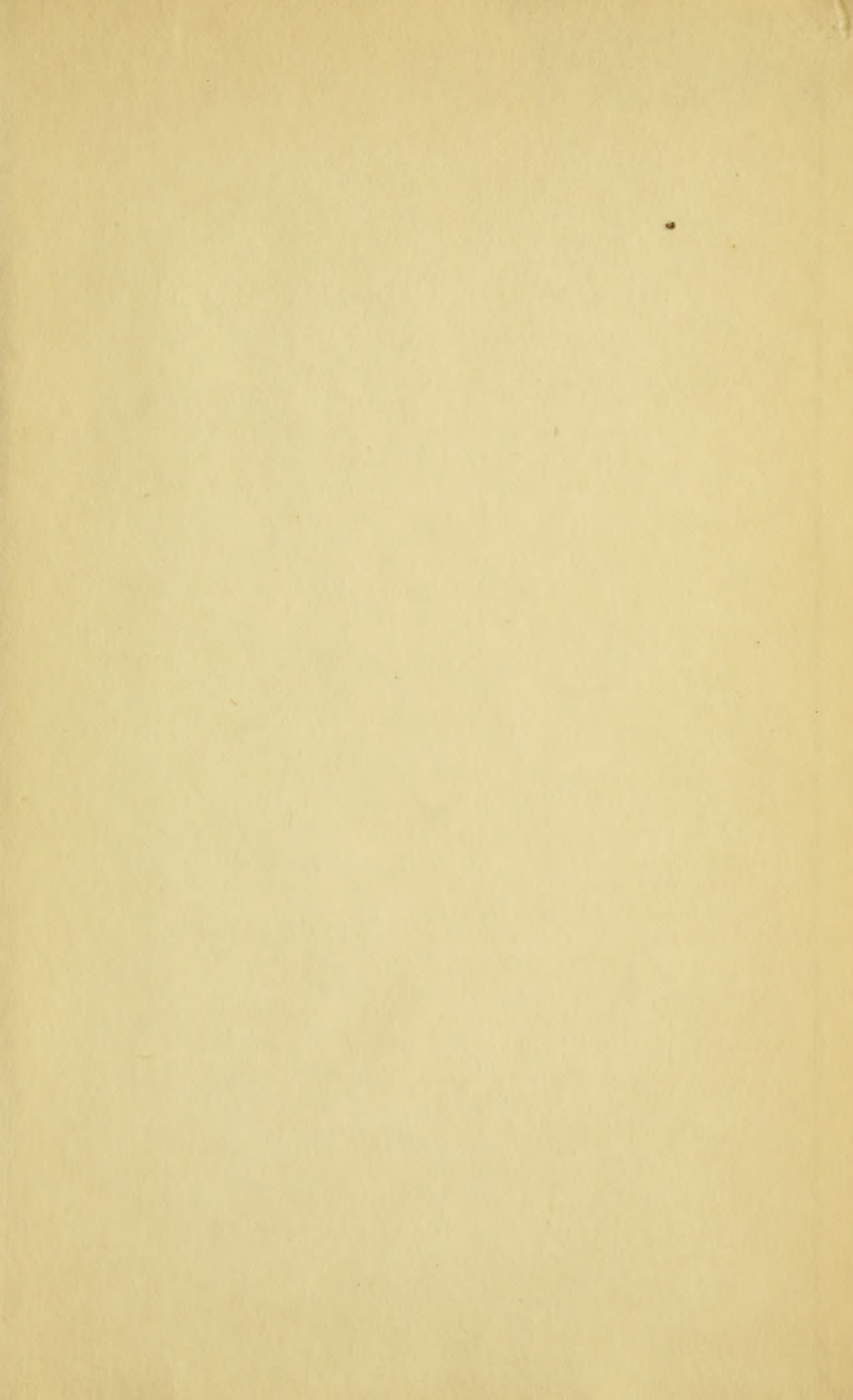
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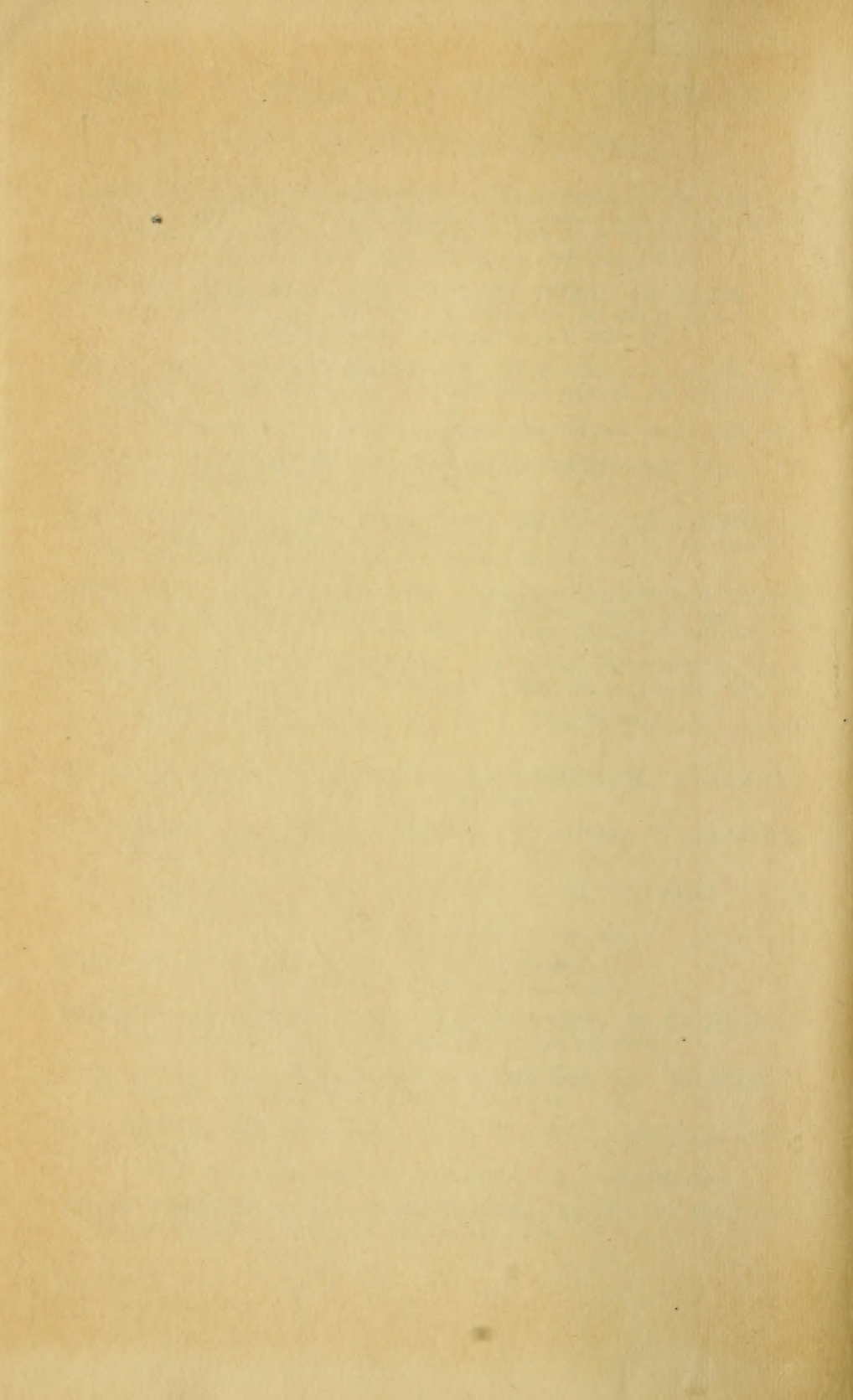
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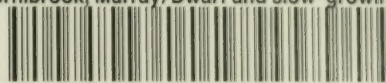
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